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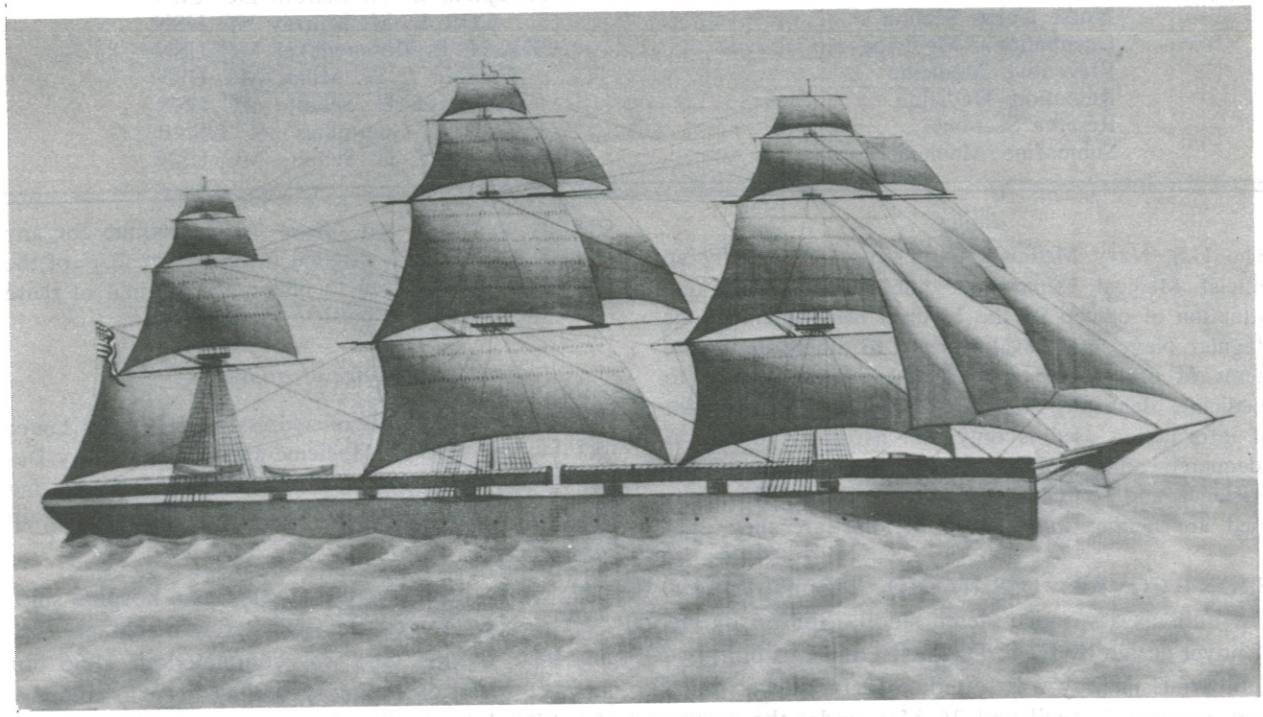

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Change of Address

Please forward changes of address for the News Letter to Editor: Bureau of Medicine and Surgery, Navy Department, Washington, D.C. 20390 (Code 18), giving full name, rank, corps, old and new addresses, and zip code.

FRONT COVER: USS IDAHO. The first IDAHO the only ship with this name to serve as a hospital ship, was built as a wooden steam sloop 1863-64 by George Steers, New York. Her twin-screw machinery was of novel design by E. N. Dickerson and was built by Morgan Iron Works. She was completed in 1866 but upon trials in May was found to be far slower than the contract speed of 15 knots, having been in commission between 2 April and 26 May under the command of CAPT John L. Worden. A board of Naval Officers recommended her rejection, but Dickerson appealed to Congress and obtained a resolution in February 1867 for her purchase by the Navy. She was subsequently converted to a full-rigged sailing ship at New York and recommissioned 3 October 1867, LT Edward Hooker in command.

The converted IDAHO was one of the fastest sailing ships of her day, and sailed 1 November 1867 for Rio de Janeiro. From there she continued the long voyage to the Far East, arriving Nagasaki 18 May 1868. The ship remained there for fifteen months as a store and hospital ship for the Asiatic Squadron.

In mid-August 1869 IDAHO moved to Yokahoma to prepare for the long voyage back to the United States, and soon afterward, 20 September, she got underway for San Francisco. Next day, however, the ship was hit by a raging typhoon. Her masts were carried away and her hull was severely damaged, but the stout ship stayed afloat and was brought back to Yokohama by her crew. Little more than a hulk, the gallant IDAHO remained in the harbor until decommissioning 31 December 1873. She was sold in 1874 to East Indies Trading Co.

The issuance of this publication approved by the Secretary of the Navy on 4 May 1964.

COMPLICATIONS AFTER LOW-BACK FUSION IN 1,000 PATIENTS A COMPARISON OF TWO SERIES ONE DECADE APART*

By S. Richard Prothero MD†, James C. Parkes MD†, and Frank E. Stinchfield MD‡, New York, N.Y. From the New York Orthopaedic Dispensary and Hospital, New York. J. Bone Joint Surg 48(1): 57-64, January 1966.

The introduction of operative fusion of the spine for Pott's disease by Hibbs and Albee in the early part of this century marked the beginning of the use of this procedure in the treatment of a wide variety of diseases and abnormalities of the spine. During the evolution of spine fusion, numerous modifications and improvements in technique have been introduced. Although the effectiveness of fusion in the treatment of certain conditions has been questioned in some quarters, the procedure continues to be widely employed, and therefore periodic reevaluation is necessary. Much has been written concerning the results of spine fusion by various techniques for many conditions, but little information is available relative to the complications that may ensue.

It was the purpose of our study to evaluate complications after fusion of the lumbar and lumbosacral spine and to determine what effect certain modifications of technique and of postoperative management had on the incidence and seriousness of the complications.

Material for Study

Five hundred consecutive cases of fusion of the lumbar and lumbosacral spine performed at The New York Orthopaedic Dispensary and Hospital in each of two periods, 1951 to 1953 and 1959 to 1963, were reviewed. There were thus two series for comparison, approximately a decade apart. During the interval between these periods, a gradual modification in the general approach to spine fusion took place at our hospital. Whereas in general we were, and still are, performing the Hibbs type of interlaminar fusion, certain changes have been made, the most significant being an increasing tendency to include more of the lateral elements in the fusion mass. Postoperative management has also been altered. The time periods were therefore selected to permit evaluation of the effect of these modifications upon the incidence of complications.

All cases of fusion of the lumbar and lumbosacral spine during these periods were included in the study, regardless of the indication for surgery. Operations were performed by attending surgeons, fellows, and members of the resident staff. All postoperative complications were recorded, as were failures of fusion, which were classified as long-term complications. An attempt was then made to compare and analyze the significance of the differences in the complications occurring in each of the two periods studied.

General Characteristics of the Two Periods

An over-all comparison of the populations constituting the two groups was made. The male-to-female ratio was approximately 1:1 in each period, and the age distribution was essentially the same (Table I). The youngest patient operated on was a child, ten years old, with spondylolisthesis; the oldest, a man, sixty-nine years old, with osteo-arthritis.

Although the indications for fusion were much the same in both groups, there was an increase in the number of fusions performed after removal of a herniated disc and a decrease in fusions carried out for unstable spines in the second series (Table II). No fusion in this part of the spine was performed for tuberculosis or other infectious disease during either period.

As mentioned previously, during the ten-year interval there was a tendency at our hospital to carry out more extensive procedures in an attempt to attain a higher rate of successful fusion. In addition, progressively earlier ambulation was allowed in

* Read at the Annual Meeting of The American Orthopaedic Association, Hot Springs, Virginia, June 29, 1965.

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accordance with the findings of Watkins and Bragg. This change in approach resulted in several differences between the two groups—longer operating time and greater blood loss, but earlier ambulation after operation and decreased time spent in the hospital were common to the second series.

The average duration of the operative procedure was 222 minutes in the first group and 246 minutes in the second. The average amount of blood replacement was 850 milliliters in the first, and 1,050 milliliters in the second group. The average time before the patients were allowed to walk was 18.5 days in the first, and 10.5 days in the second group, while the average duration of hospitalization was 27.7 days in the first group and 19.9 days in the second.

TABLE I

AGE DISTRIBUTION

Age Group	No. of Cases 1951-1953	1959-1963
10-19	20	23
20-29	79	60
30-39	160	145
40-49	170	183
50-59	61	75
60-69	10	14

TABLE II

Indication for Fusion	No. of Cases 1951-1953	1959-1963
Herniated disc	329	371
"Unstable"	95	39
Pseudarthrosis	17	35
Spondylolisthesis	51	40
Other congenital anomaly	0	3
Osteo-arthritis	8	12

Complications

There were 511 postoperative complications (exclusive of pseudarthrosis) in the 1,000 patients studied. There were no deaths in either group (Table III).

The most common complication was urinary retention requiring catheterization on one or more occasions. This occurred in 380 patients, and led to minor infection of the urinary tract in twenty-four. After insertion of an indwelling catheter, each of the 380 patients received sulfonamide prophylaxis, which presumably was responsible for the low incidence of infection.

Both the urinary retention and the reflex ileus that occasionally occurred were probably related to retroperitoneal hemorrhage with irritation of the sympathetic chain. The increased incidence in the more recent group may perhaps be explained on the basis of the more extensive and prolonged procedure. The incidence of all other complications was relatively low, with the exception of thromboembolic phenomena and wound infection. Whereas the incidence of other complications remained essentially stable in the two groups, the incidence of the latter two complications decreased markedly during the period from 1959 to 1963. For this reason, a more detailed evaluation of these complications was carried out.

TABLE III

COMPLICATIONS FOLLOWING SPINE FUSION

Complication	No. of Cases 1951-1953	1959-1963
Urinary retention	150	230
Urinary tract infection	10	14
Ileus	11	9
Penicillin reaction	4	0
Transfusion reaction	2	0
Pneumonia	2	2
Atelectasis	0	2
Gout	2	1
Shock	1	1
Wound Infection	21	13
Thromboembolism	21	11
Death	0	0
Miscellaneous	3	1

Thromboembolic Complications

Thromboembolism was undoubtedly the most serious complication we encountered in our series, in terms of immediate life-threatening potentiality. Its significance as a sequel to spine fusion was pointed out by Shaw and Taylor. In the period from 1951 to 1953, twenty-one patients had thromboembolic disease, an incidence of 4.2 percent. Five of these patients had pulmonary emboli. All received anticoagulants and there were no deaths. During this period, the average duration of recumbency in bed after operation was 18.5 days and symptoms of thromboembolism occurred, on the average, fourteen days after operation.

During the second period studied (1959 to 1963), eleven patients had thromboembolism, an incidence of 2.2 percent, and two had pulmonary emboli. Again, all received anticoagulants and no deaths resulted. The average duration of recumbency during this period was 10.5 days and the average time of occurrence of thromboembolic symptoms was the eleventh day.

With the exception of earlier ambulation in the second period, there was no other factor which correlated with the decrease in incidence. The age distribution in the two groups was essentially the same (Table I), and the duration of surgery was longer in the group with the lower incidence.

To evaluate other factors which have been suggested as influencing the development of this complication, the thirty-two cases in both series were analyzed as a group. There was a silght increase in incidence with advancing age, but not one patient in the seventh decade had postoperative thromboembolism. In patients in the third and fourth decades the incidence was 2.25 percent, and in the fifth and sixth decades, 4.5 percent.

The incidence by sex was exactly equal. There was no significant correlation with concomitant medical problems, length of surgery, or amount of blood replacement. Of significance was the fact that 20 percent of patients with thromboembolic complications had had peripheral vascular disease. It was also of interest that the thromboembolism developed on the side from which the iliac-crest graft had been taken in 67 percent of the cases, as previously found by Shaw and Taylor.

It is well known that thromboembolic complications are most likely to occur after pelvic procedures and laparotomy. It is not so well known that the incidence is also relatively high after spine fusion. Tubiana and Duparc reported an incidence of 4.5 percent after spine fusion, compared with an incidence of less than 2 percent after general surgical procedures. Shaw and Taylor also found a significant incidence after spine fusion. Factors implicated as tending to increase the incidence after surgery of all types include advanced age, obesity, previous peripheral vascular disease, cancer, and congestive heart failure. Our study tends to substantiate the significance of peripheral vascular disease and advancing age, although in our patients, age was not an impressive factor.

Pelvic congestion at the time of surgery (caused by the prone position), prolonged recumbency after operation, combined with the patient's reluctance to move his lower extremities because of pain at the operative site, or root irritation may be factors, as well as the congestion and irritation secondary to the operative procedure required to obtain the autogeneous graft from the iliac crest.

The findings in our study demonstrate a significant decrease in thromboembolism since the institution of earlier ambulation after spine fusion; they also emphasize the value of immediate therapeutic anticoagulation once the diagnosis of thromboembolism is made.

Wound Infections

In analyzing the postoperative infections, only clinically established infections with accompanying systemic reaction were considered significant and included in our figures. Slight wound erythema, skin necrosis, stitch abscesses alone, or a nonspecific systemic reaction were not considered infections, and were excluded. In addition, all wounds classified as infected had positive bacteriological cultures.

The over-all infection rate for our two groups was 3.4 percent, which corresponds closely with the rates reported by others. However, the incidence decreased during the more recent series. In the period from 1951 to 1953, the rate was 4.2 percent; a decade later the rate had decreased to 2.6 percent. Our initial interpretation was that this drop merely reflected increased understanding and application of aseptic techniques, but analyses of relative rates of infection in large series of clean surgical wounds have shown that although morbidity and mortality after wound infections have decreased with the use of antibiotic therapy, their incidence has remained much the same over the past twenty-five years. The significant change seems to be that whereas, in the past, the vast majority of infections were caused by hemolytic streptococcus, in recent years *Staphylococcus aureus* is the most commonly implicated organism.

As may be seen in Tables I and II, age, sex, and operative indications were comparable in the two groups. All the procedures were performed in the same operating rooms, and the ward environment was unchanged. Two variables that would be expected to increase the infection rate were operative in the second group studied—increased operating time and earlier walking. Nonetheless, the infection rate declined, and the one factor that seemed to correlate with the higher infection rate in the first group was the almost routine prophylactic use of antibiotics after operation.

During the period 1951 to 1953, 94 percent of patients undergoing spine fusion were given post-

operative antibiotics, most commonly penicillin in a dose of 800,000 units a day for ten days. During this period the infection rate was 4.2 percent. In the period 1959 to 1963, 22 percent of patients undergoing spine fusion received similar postoperative antibiotics and the infection rate was 2.6 percent.

In an attempt to evaluate the influence on the infection rate of antibiotics used in this way, the two groups were combined to give a total of 1,000 patients who underwent the same type of surgery, and nearly equal numbers of patients with and without postoperative antibiotics. A critical review of the indications for the use of antibiotic coverage revealed no evidence that the antibiotics were given to patients more likely to have infection; indeed the use of antibiotics was entirely arbitrary and even routine on the part of the operating surgeon. Of the 1,000 patients, 580 did and 420 did not receive antibiotics. Of those receiving antibiotics twenty-two (3.8 percent) had postoperative infections; of those not receiving antibiotics twelve (2.8 percent) had wound sepsis. There was no correlation with age, sex, associated medical conditions, type of fusion performed, or length of operation.

The predominant organism cultured from the wound was *Staphylococcus aureus* in thirteen of the twenty-two patients in the first group and in eleven of the twelve patients in the second group with wound infection. Streptococcal infections occurred four times in the first and twice in the second group. In addition, there were two infections caused by *Escherichia coli* and one each by *Pyocyaneus* and *Aerobacter aerogenes* in the first group. Thus the staphylococcus that was responsible for 70 percent of the infection has clearly become the common offender in recent years, and more of the staphylococci were penicillin resistant in the more recent period.

Our analysis of the incidence of infection following spine fusion in these two periods yielded little, if any, new information. Our study did indicate, however, that early walking and prolongation of operating time in order to improve the chances of successful fusion did not increase the likelihood of infection.

The influence of prophylactic antibiotics was less clear. Since the advent of the antibiotic era, there has been a continuing controversy concerning the efficacy of the prophylactic use of antibiotics in the care of patients undergoing clean operative procedures. Numerous studies have been carried out relative to the use of prophylactic antibiotics in general surgery, and several more recent studies have been limited to the field of orthopaedic surgery. Valid evidence that prophylactic antibiotics, as generally employed, prevent infection in clean wounds has not been presented, while studies that demonstrate the ineffectiveness of such use are many. Although few authors have condemned their use as dangerous, Tachdjian and Compere, from their study of clean major orthopaedic operations stated that the "routine use of postoperative antibiotics as a prophylactic measure is unwise."

Our study of the use of prophylactic antibiotics in preventing infection following spine fusion is subject to the same criticisms that have been made in the past—it was a retrospective study, with the inevitable shortcomings of such studies, and the antibiotics as given were not truly prophylactic. It has been suggested that the only true form of prophylaxis using antibiotics requires the establishment of adequate blood levels of a broad-spectrum bacteriocidal agent prior to beginning surgery and continuing these levels postoperatively until the wound is healed with no danger of further contamination. No such study

TABLE IV

TYPES OF FUSION AND INCIDENCE OF PSEUDARTHROSIS

Procedure	No. of Cases 1951-1953	No. of Cases 1959-1963	Total No. Cases Followed	No. Pseudarthroses	Rate *(Per cent)*
Hibbs	73	16	44	9	20.5
Hibbs + bank bone	47	69	44	11	25.0
Hibbs + autogenous bone	106	206	170	24	14.1
Hibbs + bank bone + autogenous bone	1	20	0	—	—
Hibbs + H-graft	137	48	67	8	11.9
Hibbs + screws	108	7	57	8	14.0
Lateral element	8	134	48	5	10.4

has appeared in the literature to our knowledge. We have now instituted such a prospective double blind study, using interoperative antibiotic prophylaxis, at our hospital.

Despite the shortcomings of our survey, it does show the results with a method of prophylaxis used in many hospitals today, and the conclusion seems warranted that there is no evidence whatsoever that postoperative antibiotics are of value in decreasing the incidence of wound infection after clean surgical operations on the low back. Furthermore, there is a definite suggestion, from this and other studies, that use of antibiotics in this manner may increase the risk of infection. Although the mechanism of this has never been demonstrated, it seems possible that the antibiotics mask incipient mild infection, or perhaps alter the contaminant flora of the wound so that a resistant organism, often staphylococcus, can multiply. Added to this apparent disadvantage is the well-recognized risk of furthering the development of resistant organisms in the population at large by the widespread use of antibiotic agents without definite indications.

Pseudarthrosis

A review of the literature relative to rates of failure in low-back fusion reveals that the rate varies from 2 to 55 percent in large series. Such are the vagaries of individual interpretations of results. For this reason, no attempt was made to compare our results with those of others; rather, an attempt was made to analyze the results in our series with respect to the few types of fusion employed.

During the periods studied, only a few of the many types of fusion procedures described in the literature were employed. We have had no experience with anterior fusion of any type in the lumbar spine. The basic Hibbs fusion, with occasional modifications, was used but in recent years this fusion has been made more extensive, extending out to the lateral elements.

Of the 1,000 patients studied, only 430 were considered to have had adequate follow-up relative to the development of pseudarthroses. In these 430 cases, the average follow-up was thirty-three months; no patient was included with a follow-up of less than six months. For all patients there was a clinical evaluation of the state of fusion, as well as roentgenographic studies that usually included flexion and extension films or laminagrams made at the time of last follow-up evaluation.

The types of fusion performed during the two periods studied are listed in Table IV. The Hibbs fusion and its modifications formed the bulk of the procedures, although in the first period the H-graft modification was frequently employed. In the more

TABLE V

PSEUDARTHROSES RELATED TO TYPE AND EXTENT OF FUSION

	One Joint Fusions			Multiple Joint Fusions		
	No. Cases Followed	No. Pseudarthroses	Rate *(Per cent)*	No. Cases Followed	No. Pseudarthroses	Rate *(Per cent)*
Hibbs	85	9	10.6	173	34	19.6
H-graft	36	3	8.3	31	5	16.1
Lateral element	9	1	11.1	39	4	10.3

TABLE VI

PSEUDARTHROSIS RELATED TO LEVEL OF FUSION

Level of Fusion	No. Cases	No. Cases Followed	Pseudarthrosis	Rate *(Per cent)*
L-4 to S-1	563	239	37	15.8
L-5 to S-1	261	120	10	8.3
L-3 to S-1	33	15	4	26.6
L-4 to L-5	40	22	4	18.2
L-3 to L-4	7	2	0	0
L-3 to L-5	5	2	0	0
Spondylolisthesis	91	30	8	26.6

recent period, lateral-element fusion supplanted the H-graft type to a large extent.

In the first group, the over-all incidence of pseudarthroses in the patients with adequate follow-up was 15.6 percent; in the second group, 14.4 percent. This gave a combined incidence in the 430 patients followed of 15.1 percent. From Table IV it is obvious that, in our hands, both H-graft and lateral-element fusion using supplemental autogenous bone gave the lowest incidence of failure. These figures are somewhat loaded in favor of the H-graft in that the lateral-element fusion was employed in a greater percentage of those patients in whom the chance of pseudarthrosis was greater, as for example, for spondylolisthesis, multiple-level fusion, and pseudarthrosis. The pseudarthrosis rate in multiple-joint fusions using the lateral-element technique was only 10.3 percent.

It is also of significance that in those patients in whom homogenous bank bone was used, the rate of pseudarthrosis was much higher than in the patients in whom autogenous bone was used. The Hibbs fusion, combined with screws through the articular processes, gave the same results as the Hibbs fusion using autogeneous bone.

As has been stated by other investigators, we found that the more vertebrae included in the fusion mass, the higher the incidence of pseudarthrosis (Table VI). It was also evident that we have not solved the problem of failure of fusion in spondylolisthesis.

No relationship was found between the duration of recumbency after fusion and the development of pseudarthrosis. As mentioned previously, although patients in the second group got out of bed considerably earlier than those in the previous period, the incidence of pseudarthrosis was less. In both groups, the average day on which walking was begun in the patients with pseudarthroses corresponds almost exactly to the average for the group as a whole.

As a result of our findings relative to the development of pseudarthrosis, we now perform a Hibbs or H-graft type of fusion when one joint is being fused. For pseudarthrosis, spondylolisthesis, multiple-joint fusion, or large interlaminar defect, the lateral-element fusion is employed. Supplemental autogenous bone from the iliac crest is used unless the operative situation dictates otherwise.

Summary and Conclusions

1. The complications after low-back fusion in two series of 500 cases each, one decade apart, were analyzed and compared.

2. The most common complication was urinary retention. Prophylactic sulfonamide therapy after catheterization prevented subsequent urinary tract infection.

3. The over-all incidence of thromboembolic complications was 3.2 percent. The incidence decreased from 4.2 in the first to 2.2 percent in the second series concomitantly with, and probably as a result of, earlier walking.

4. The immediate institution of anticoagulant therapy following the diagnosis of thromboembolism resulted in complete recovery in the thirty-two cases in the combined series.

5. The incidence of thromboembolic complications was found to be slightly higher in older patients and in those with prior history of peripheral vascular disease.

6. Peripheral phlebothrombosis developed on the side from which the iliac-crest graft was taken in 67 percent of cases.

7. Wound infection as a complication of spine fusion occurred in 3.4 percent of our patients.

8. Increased operating time and early ambulation after spine fusion did not appear to increase the risk of infection.

9. Postoperative antibiotic prophylaxis did not decrease the incidence of infection and may have increased the risk.

10. Pseudarthrosis developed in 15.1 percent of the 430 cases followed, with the lowest rates following fusion by the H-graft and lateral-element techniques.

11. Pseudarthrosis developed in only 10.3 percent of the multiple-joint fusions in which the lateral-element technique was employed.

12. The incidence of pseudarthrosis increased as the number of vertebrae in the fusion mass increased.

13. Earlier walking did not increase the incidence of pseudarthrosis.

(The references may be seen in the original article.)

EIGHTEEN-MONTH FOLLOW-UP OF GASTRIC FREEZING IN 173 PATIENTS WITH DUODENAL ULCER

Claude R. Hitchcock, MD PhD, Ernest Ruiz, MD, R. Duncan Sutherland, MD, and James E. Bitter, MD. *JAMA 195(2):115-119, January 10, 1966.*

Gastric freezing for chronic duodenal-ulcer disease has been performed in 173 cases and an 18-month minimum follow-up has been achieved. The overall study indicates that 92.5% of the patients had symptoms or corrective surgery for recurrent disease at the time of the 18-month evaluation. Patients experience relief from previously distressing symptoms immediately following gastric freezing but the secretion of hydrochloric acid quickly returns to prefreeze levels or higher. Some patients are deceptively asymptomatic at three months postfreeze although acid levels are again high. Gastric freezing is a dramatic episode in the life of a patient with chronic duodenal ulcer and it appears to have a rather strong emotional appeal and to support subjective relief even in the absence of objective improvement.

Recently, we and others have reported studies of gastric freezing for duodenal ulcer which showed an immediate but transient relief of pain and other symptoms following the therapy.[1-5] Commonly, however, by three months postfreeze, about 40% of our patients at the Hennepin County General Hospital have had a return of distressing symptoms, and at six months, about 60% no longer benefit significantly from the procedure. Our second report from the General Hospital showed that 17 of a small group of patients (22) who received gastric freezing for duodenal ulcer had distressing symptoms at 12-months postfreeze.[2] It is now possible to report on our entire group of 173 patients, each with a minimum of 18 months' follow-up after freezing. We believe the longer follow-up results of this procedure, as here reported, are revealing.

All subjects in our series were "private" patients referred by their family physician for gastric freezing. All had distressing effects of the duodenal-ulcer diathesis. There were 56.6% who had experienced a complication such as perforation, hemorrhage, intractable pain, or partial obstruction. Each patient had one or more of the following indications: (1) x-ray evidence of duodenal ulcer such as bulb deformity or active duodenal crater or both, (2) history strongly indicative of duodenal-ulcer diathesis, and (3) presence of significant amounts of free hydrochloric acid. The average age of this group was 45 years, with a range of 17 to 79 years; all but four were males. The average duration of symptoms was 10.4 years with a range of 2 months to 47 years.

Specific contraindications for freezing were (1) the absence of free hydrochloric acid on an overnight gastric analysis or a basal gastric aspirate test, (2) partial gastric-outlet obstruction (greater than 40% retention) of a standard barium meal on a one-hour follow-up scout film of the abdomen, (3) upper-gastrointestinal-tract bleeding within six weeks prior to admission, (4) gastric ulcer, and (5) previous major gastric surgery. Patients who had a free duodenal perforation treated by simple omental plication were not excluded from the freezing procedure provided they were more than six weeks postoperative. A 100% follow-up has been achieved by questionnaire and telephone contacts. The greatest distance of a patient away from the hospital was Anchorage, Alaska.

Procedure

The technique used in this series was a 50-minute gastric freeze with a hypothermia machine and a rubber balloon, with an average inflow temperature of −0.4 F (−18 C) and an average return temperature of 12.2 F (−11 C). The procedure is well documented in the literature.[1-5] For the patient's comfort, we used a prefreeze medication of chlorpromazine hydrochloride (Thorazine), 15 mg, atropine, 0.4 mg, and phenobarbital, 60 mg. On admission to the hospital, each patient underwent an upper-gastrointestinal-tract roentgenographic series and a one-hour basal gastric aspirate study. Vagal response was determined with a standard insulin-stimulation test by use of 15 units of regular insulin given intravenously.[1,2] Antral response was assessed

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with the standard peptone-stimulation test by use of 100 cc of 10% peptone solution in the nasogastric tube. These studies were performed prefreeze, within 24 hours postfreeze, and at each return visit (six weeks, three months, six months, and one year). The 18-month follow-up was accomplished by questionnaire or telephone.

On discharge from the hospital, our patients were instructed to eat a bland diet for one week postfreeze and then return to a regular diet, low in spices. They were also encouraged to abstain at all times from coffee, tea, alcohol, and smoking. This protocol of patient management was adopted from the study at the University of Minnesota Hospital where gastric freezing was originated by Wangensteen and his collaborators.[3, 4]

Overall Results

Figure 1 illustrates the overall results obtained in the 173 patients. After a minimum of 18 months' follow-up, 71 or 41%, are experiencing distressing symptoms and are dissatisfied with their results. Corrective surgery has been performed for an additional 37 dissatisfied patients, or 21.4%. (Thirty-one of these patients operated upon are now without any symptoms; two patients who were operated upon have the dumping syndrome and two others are slightly symptomatic.)

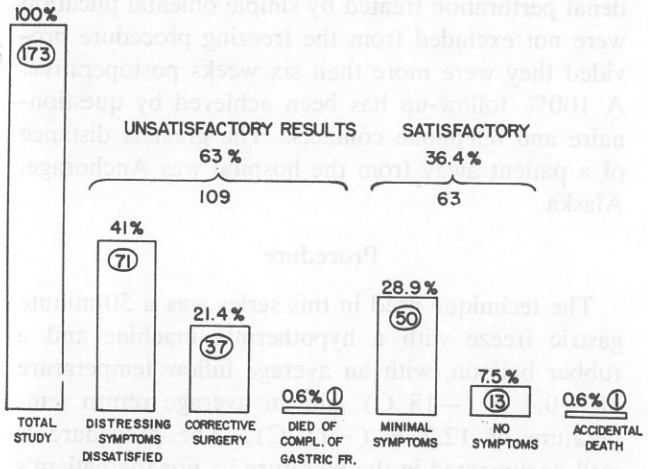

Figure 1. Total results of clinical gastric-freezing study in 173 patients with a minimum of 18 months follow-up postfreeze.

One patient died five months after his gastric freeze from perforation of a benign gastric ulcer. He had experienced no pain following freezing until the perforation occurred, although pain was present prior to the freezing procedure. At autopsy, a duodenal ulcer was found associated with a highgrade pyloric obstruction. During examination three months postfreeze, no ulceration was demonstrated in this patient on an upper gastrointestinal-tract x-ray examination.

Fifty patients, or 28.9%, are experiencing minimal symptoms and, after 18 or more months, believe the gastric freezing was of some benefit. Thirteen, or 7.5%, disclaim any symptoms or discomfort. One patient died in an auto accident 11 months postfreeze; he was without symptoms to that time as far as can be determined. Therefore, a total of 109 patients, or 63.7% of the total, have declared an unsatisfactory result and 63, or 36.4%, have had a result which they consider satisfactory, during the 18-months follow-up. Figure 2 graphically shows the number of patients with one and two freezes in each category. Forty-eight, or 27.7% of 173 patients, had a second freeze after the return of symptoms. No patient receiving a second gastric freeze remained asymptomatic during the 18 months of follow-up.

Results After One Freeze.—Figure 3 shows the status of the 125 patients who were frozen only once. Patients frozen twice are excluded from this graph although technically they are single-freeze failures. Forty-nine, or 32.9% are experiencing distressing symptoms and are definitely dissatisfied with their results. Twenty-three, or 18.4%, have undergone corrective surgery, and there was one death due to duodenal perforation without pain five months following freezing. A total of 58% have had an unsatisfactory result if we do not include those with minimal symptoms. Thirty-nine, or 31.2%, are experiencing minimal symptoms and 13, or 10.4%, deny any symptoms. Therefore, by this calculation, a total of 41.6% have had what may be termed a satisfactory result. When we include the 48 refreeze patients as failures, the satisfactory group drops to 30%.

The 13 patients without symptoms did not differ from the overall group in age or duration of symptoms. Nine had complications previously and six had demonstrated ulcer craters when first seen. Gastric-secretion studies, both prefreeze and postfreeze, had results typical of those noted for the entire group.

Results After Two Freezes.—Figure 4 illustrates the outcome for 48 patients who underwent a second freeze on return of symptoms. Twenty-three (47.9%) are experiencing distressing symptoms and are dissatisfied. Fourteen (29%) have undergone corrective surgery; a total of 77%, therefore, have had

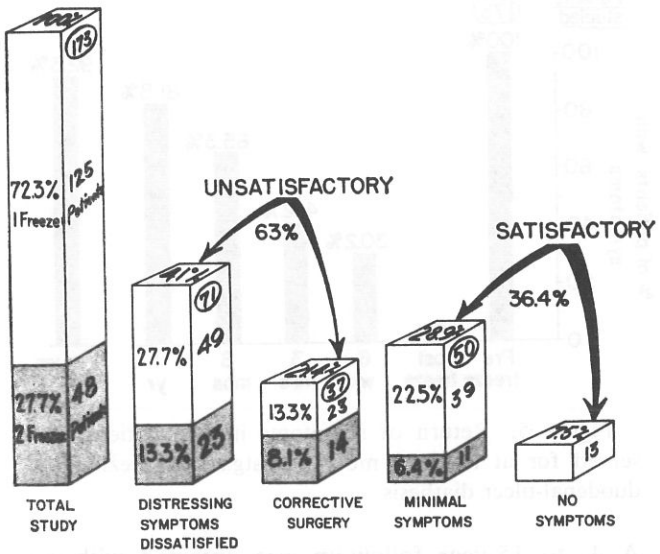

Figure 2. Comparative results of patients with single gastric freeze and second gastric freeze.

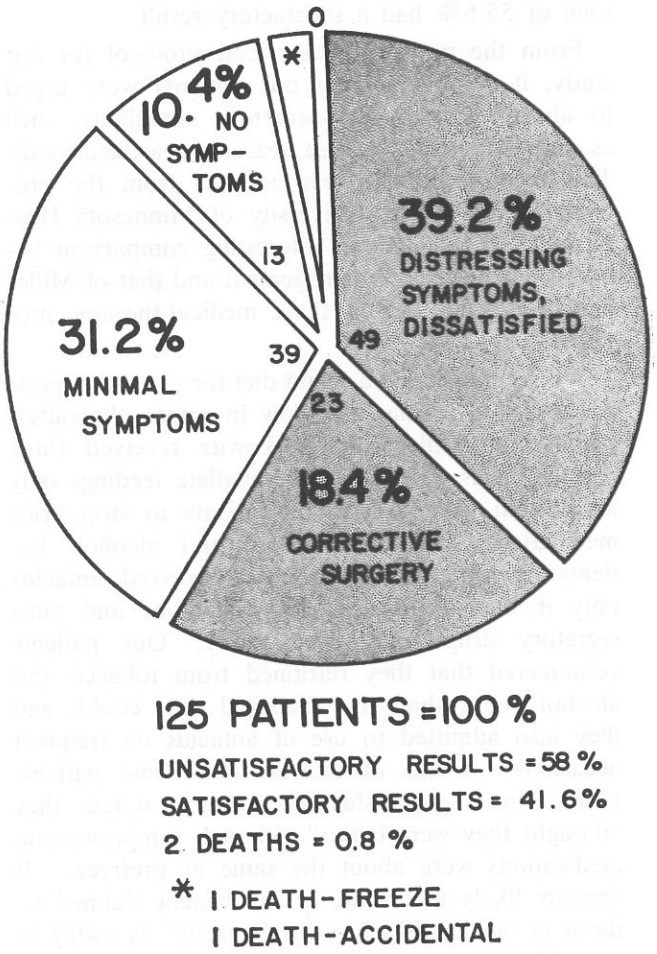

Figure 3. Status of 125 patients who received one gastric freeze with 18-month-or-more follow-up.

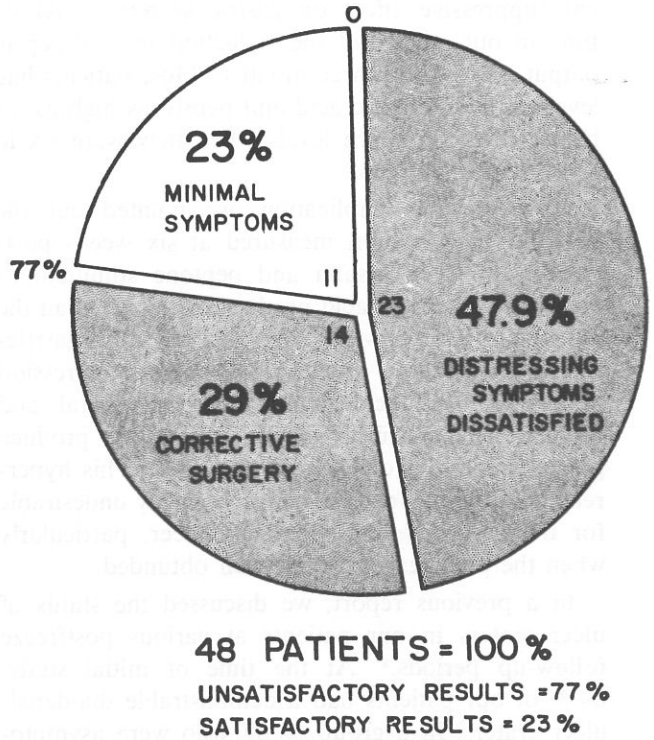

Figure 4. Results in 48 patients who received a second gastric freeze and were observed for a minimum of 18 months.

unsatisfactory results. Eleven (23%) are having minimal symptoms but there are none in this second freeze group who are completely free of symptoms. Although refreezing for the third time was offered to these patients, they all refused further therapy of this kind.

Comment

As shown in Figure 5, at six months, 65.3% of our patients had a return of symptoms and 34.7% were asymptomatic. At one year postfreeze, 81.8% of our patients were symptomatic with regard to their duodenal ulcer, and at 1½ years postfreeze, 92.5% of our patients either have some symptoms of their ulcer or have had surgery.

During the study, we commonly noted a transient drop in gastric acidity in terms of mean values of hydrochloric acid that occurred in our patients immediately postfreeze.[1,2] A comparable drop was found when antral secretion was selectively tested with peptone and vagal response was tested with insulin. Statistical analysis of the degree of hypochlorhydria which occurred in our patients gave a P value <0.001.[2] On this basis, we believe that gastric freezing does have a demonstrable but transi-

ent suppressive effect on gastric secretion. At no time in our study did the reduction in acid-pepsin output last beyond three months. Most patients had levels of hydrochloric acid and pepsin as high as, or higher than, prefreeze levels when they were six to eight weeks postfreeze.

In a previous publication, we pointed out the rebound phenomenon measured at six weeks postfreeze with both insulin and peptone stimulation.[2] Here the amount of acid produced is higher than the mean prefreeze levels. We believe the gastric-freezing procedure, after an immediate suppression of hydrochloric acid, stimulates both antral and cephalic mechanisms of gastric secretion to produce greater quantities of hydrochloric acid. This hyperreactive state obviously is physiologically undesirable for the patient with a duodenal ulcer, particularly when the pain response has been obtunded.

In a previous report, we discussed the status of ulcer craters in our patients at various postfreeze follow-up periods.[1] At the time of initial study, 64% of our patients had a demonstrable duodenal-ulcer crater. In a group of 87 who were asymptomatic at the six-weeks postfreeze examination, 57 had a disappearance of their craters. At that time of follow-up, in a group of 31 patients with reappearance of symptoms following freezing, only four had a disappearance of the ulcer crater by x-ray examination. Those whose craters did heal during this period of relative hypochlorhydria tended to have them stay healed for several months, since at the six-months follow-up, 29 of the asymptomatic group who previously had craters were still healed as demonstrated by x-ray examination.

We believe that refreezing of patients who are early failures (up to four to six months) following the first-freeze procedure is not worthwhile. In Figure 2, the graphic portrayal of our data indicates that only 6.4% of those with minimal symptoms at 18-months postfreeze had a second-freeze procedure. No one with a second freeze was asymptomatic at the 18-months follow-up. Considering the second-freeze patients as a group, 77% had either corrective surgery or had distressing symptoms at the 18-month follow-up.

We believe the patients treated with gastric freeze have a clinical response essentially no better than that seen in a group of patients treated with a good medical regimen. To assess this aspect of the problem, we chose a well-documented study for comparison.[6] Miller and Berkowitz [6] in 1955 reported a large series of patients with chronic peptic ulcer treated medically, including 300 "private" patients.

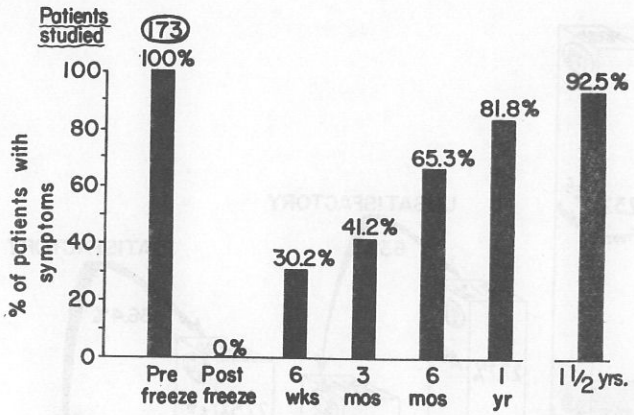

Figure 5. Return of symptoms in 173 patients observed for at least 18 months postgastric freezing for duodenal-ulcer diathesis.

A 4- to 15-year follow-up was obtained with an average of nine years. Eighteen percent of their patients felt improved and 37.6% were without symptoms at the time of writing up their study. A total of 55.6% had a satisfactory result.

From the previously described protocol for our study, it is obvious that our patients were urged to abstain from gastric-secretory stimulants, such as smoking, alcohol, coffee, tea, and seasoned foods. This recommendation was adopted from the program in use at the University of Minnesota Hospitals.[3,4] We found an interesting comparison between our postfreeze management and that of Miller and Berkowitz during their medical-therapy program.

We recommended a bland diet for one week postfreeze and a regular diet, low in spices, thereafter; patients of Miller and Berkowitz received three regular meals daily with intermediate feedings only ad libitum. We asked our patients to stop prior medications and also tobacco and alcohol. Patients of Miller and Berkowitz received antacids only if diet failed and antispasmodics and antisecretory drugs only occasionally. Our patients volunteered that they refrained from tobacco and alcohol better than they believed they could, and they also admitted to use of antacids on frequent occasions. It was of interest that some patients (listed in our satisfactory group) stated they "thought they were better" although symptoms and medications were about the same as prefreeze. It appears likely that some of the benefit claimed by those in our "satisfactory-result group" is owing to intensified interest on their part in following a more effective supportive medical regimen after the freeze procedure. This seems the more likely when we

remember that all patients experienced a return of acid secretion to prefreeze (or higher) levels.

Complications subsequent to gastric freezing occurred in 10% of our freeze procedures. These included left-abdominal-wall pain (5 cases), anorexia (1), emesis (5), melena (12), hematemesis (2), pancreatitis (1), gastric ulcer (4), and the one death due to "silent" perforation of a benign gastric ulcer in a patient made pain-free by gastric freezing. The gastric hemorrhage resulting from the induced gastric ulcers was severe and required multiple blood transfusions over the course of seven to ten days postfreeze. The patients recovered and were managed on a Sippy regimen. We believe these patients had a "true gastric freeze" due to malfunction of the hypothermia unit following necessary shop repairs. Others have demonstrated this phenomenon in animal studies. McIlrath et al reported consistent ulceration of dog and pig stomachs when the gastric wall was frozen to temperatures below 32 F (0 C) and these results were verified at laparotomy.[7]

At the time of writing, 21.4% of the 173 patients in our study had accepted surgery for correction of their duodenal ulcers. The common indications for surgery were obstruction, perforation, intractable pain, and bleeding, the same general indications so familiar to clinicians over the years. In the light of our experience with patients with chronic duodenal ulcer on a long-term basis, we can expect the percentage of our subjects requiring surgery to increase steadily. As yet, we see no "glory road" to solution of the problem of duodenal ulcer. Once the ulcerated duodenum has progressed to the chronic state and fibrosis and scarring make permanent healing impossible, the patient is committed to a tug-of-war between perseverance with a satisfactory but restrictive medical regimen and the ever-present ravages of the caustic juices of his own making. Inevitably, his emotional stamina weakens with time, and recurring exacerbations of his ulcer nudge him closer to acceptance of more definitive therapy. We believe these patients are better served with corrective surgery that now brings such positive and lasting relief.

Our data fail to show that we significantly benefited a large enough group of these subjects to make gastric freezing a worthwhile interlude in the life of a patient with a chronic duodenal ulcer.

Conclusions

An 18-month follow-up study after gastric freezing for duodenal-ulcer disease has indicated a high recurrence of symptoms in a group of 173 patients. In the overall study, 92.5% of the patients either have some symptoms, have had corrective surgery for recurrent disease, or have died (1 case). Only 7.5% of the total patients have remained completely asymptomatic for 18 months following the freezing procedure.

If we divide patients in the overall study as to kind of response, including in one group those with minimial or no symptoms as having had a satisfactory result, we have 36.4% in this category at the 18-month follow-up. On this basis, 63% had an unsatisfactory result since they continue to experience distressing symptoms, or have had corrective surgery, or have died (one case).

Our data indicates failure of a second freeze procedure to improve the patient who has responded poorly following his first gastric freeze. None of the patients in a group of 48 who were frozen a second time remained free of symptoms. Fourteen of this group had corrective surgery, and an additional 23 had distressing symptoms and were dissatisfied with the freezing procedure.

The low temperature of the stomach wall achieved with gastric freezing does reduce gastric acidity for approximately six to eight weeks post-treatment. This has been evident in our study from both the antral-stimulation and vagal-stimulation responses. There is a positive correlation, however, between the return of acid and pepsin secretions (sometimes to higher than prefreeze levels) and the subsequent return of symptoms and ulcer craters. Coincident with the relative hypochlorhydria, it was not surprising to find a significant number of our patients (65%) with a disappearance of their ulcer craters for a period of three to six months following the freezing procedure. However, most of these patients developed craters or other evidences of activity of their ulcer by 9 to 12 months post-treatment.

We have been impressed with the intense desire on the part of many of our patients to be improved by this form of therapy which is more vigorous than any they have previously experienced. Gentle persuasion during follow-up questioning, however, has indicated that many patients had medicated themselves with antacids and had eaten carefully and selectively for many months when symptoms had reappeared. It appears that a more dramatic therapeutic episode such as gastric freezing can improve the emotional outlook in some patients suffering from duodenal-ulcer diathesis without actually improving the physiological aspects of the disease process. A comparison of our study with a reported medical-therapy program of Miller and Berkowitz indicates a

significant degree of similarity in the overall management and conduct of the patients following the freeze procedure in our series and in the initial examination and prescription of the ulcer program in the medical study. On the basis of our longer-term follow-up, we believe the following conclusions can be drawn: (1) Gastric freezing, carefully performed, can be a safe procedure to temporarily reduce the acid and pepsin secretions from the stomach for short periods of time (up to eight weeks postfreeze). (2) Immediately following the freezing procedure, all patients experience relief from previously uncomfortable symptoms. However, secretion of acid and pepsin commonly returns while the patient continues to enjoy relief of symptoms. At three months postfreeze, all patients in this series were secreting acid at prefreeze levels (or higher) and 58.8% were still deceptively asymptomatic. (3) At six months postfreeze, 65.3% of our patients were symptomatic again or had accepted surgery for correction of their duodenal-ulcer diathesis. At 18 months follow-up, if we consider patients with minimal symptoms as a satisfactory result, our data show 36.4% to be in the "satisfactory result" category, and 63.6% are classed as "unsatisfactory." (4) Refreezing the patient who fails to have a significant reduction in symptoms beyond three months does not improve his chances for longer-term relief from symptoms of the disease. (5) Gastric freezing is a dramatic therapeutic episode in the life of a patient with chronic duodenal ulcer, and it may serve as an emotional crutch to provide symptomatic relief even in the face of high-acid secretion. Loss of pain response can be a prelude to a catastrophe such as perforation under these conditions. (6) After 18-months follow-up, 92.5% of our patients with one or two gastric freezes had had surgical correction of their disease, some return of symptoms, or had died. We believe that gastric freezing, as presently conceived and practiced, has limited value in the treatment of patients with chronic duodenal ulcer.

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Generic and Trade Names of Drug

Chlorpromazine hydrochloride—*Thorazine.*

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LYMPHANGIOGRAPHY OF THE RETROPERITONEAL LYMPH NODES THROUGH THE INGUINAL ROUTE

E. Sayegh, T. Brooks, E. Sacher and F. Busch. From the United States Naval Hospitals, Portsmouth, Virginia and San Diego, California. J Urology 95(1): 102-107, January 1966. Copyright by The Williams and Wilkins Co., Baltimore, Md. 21202, U. S. A.

It has been more than 6 years since we started exploring the possibilities of lymphangiography through the lymph vessels in the spermatic cord. Our first objective was to study the normal anatomy of the testicular lymph vessels and their nodal drainage. It soon became evident that this was an adequate method both for the study of the retroperitoneal lymph nodes in the lumbar area and the diagnosis of their involvement by cancer metastasis. Such knowledge, if precisely available, would be a tremendous asset in the surgical and x-ray treatment of testicular tumors. We believe that the time has come to assess this method and its results.

The technique used has been slightly modified since our preliminary publication in 1963. As an organ, the testicle is unique in having all its lymphatic drainage confined to the narrow portals of the inguinal canal. Any lymph vessel injected in that area will visualize the retroperitoneal nodes draining the testicle, and this is precisely what does not occur in other visceral organs with multiple drainage routes, emptying in separate and different groups of lymph nodes.

The advantages of this method, when available, are obvious. The inguinal canal and the spermatic cord are of easy access. The lymph vessels are more

developed and much larger than in the distal extremities. Much smaller quantities of ethiodol are used since 3 cc is quite adequate. The large amount of ethiodol used through the pedal route has not been without morbidity and also pulmonary complications.

After injection of 1 ml Evans blue dye just beneath the tunica albuginea, the lymph vessels become visible in the inguinal area in 5 to 10 minutes. In cases of a testicular neoplasms a rubber shot clamp is gently applied at the internal ring and the dye is injected in the fold between the testicle and the epididymis under the visceral lamina of the tunica vaginalis (fig. 1).

Isolation of the vessel and its cannulation are facilitated by a tourniquet silk thread around its lumen proximally (fig. 2). Cannulation by 3½ F ureteral catheters or plastic tubes is also rendered

Figure 1. Injection of Evans blue dye in fold between testicle and epididymis under visceral lamina of tunica vaginalis.

easier by slow saline injection through the catheter as it eased through the beaded, valve-like constrictions of the lymph vessels by gentle rotation. The catheter is tied in place, brought out from the lower angle of the wound and following closure, the ethiodol is injected outside the operating room.

It is most important, as will be stressed later, to take pictures at 2, 12, 24 and 48 hours. The slow injection of 2 to 3 cc ethiodol proceeds at the rate of 1 ml every 2 hours. A catheter is left in place in case a further milliliter is needed to outline a poorly defined gland at the end of 48 hours.

Our previous anatomical concepts have been slightly modified. As is well known, most of the actual concepts of the lympathic drainage of the testicle stem from the classical studies of Most, Cuneo, and Jamieson and Dobson.

In normal subjects 4 to 8 lymphatic vessels, anastomosing freely at both their proximal and distal ends, turn sharply inward anywhere from L4 to L2. A small sentinel node seen best on the lateral view is immediately visualized before the main lateral nodes on each side are seen (fig. 3, A). This node is frequently not visualized by pedal lymphangiography. On the left side L1 and L2 are the first to be filled and are then followed by retrograde filling of L3 to L4, D12 and the thoracic duct (fig. 3, B). On the right side the flow runs

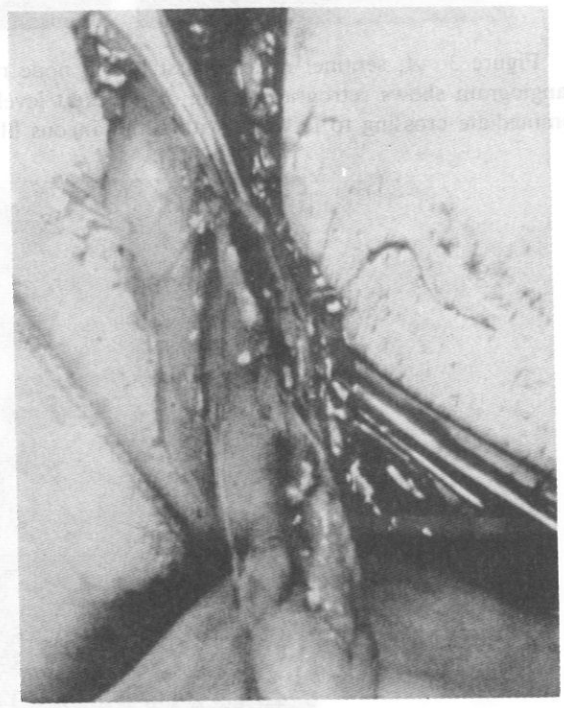

Figure 2. Lymph vessel in cord is now rendered more prominent by silk thread tourniquet applied proximally and secured by mosquito clamp.

directly to the left lateral nodes as visualization of the right superior and right inferior lateral nodes becomes apparent (fig. 3, C).

In comparison to the immediate crossing of the right lymph vessels to the contralateral side, the left vessels cross over only after the primary relays

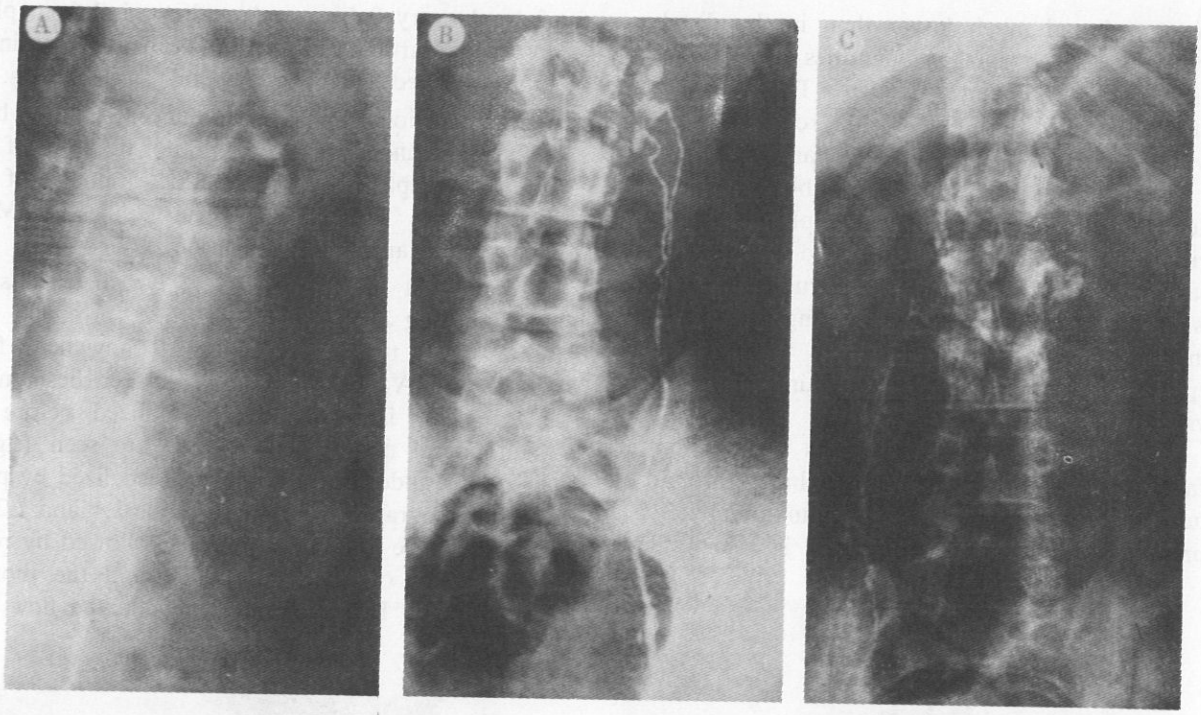

Figure 3. *A*, sentinel node or first lymph node relay seen in lateral position. *B*, normal left testicular lymphangiogram shows retrograde filling of nodes at level of L3-L4. *C*, normal right testicular lymphangiography shows immediate crossing to left side with simultaneous filling of right superior and right inferior lateral nodes.

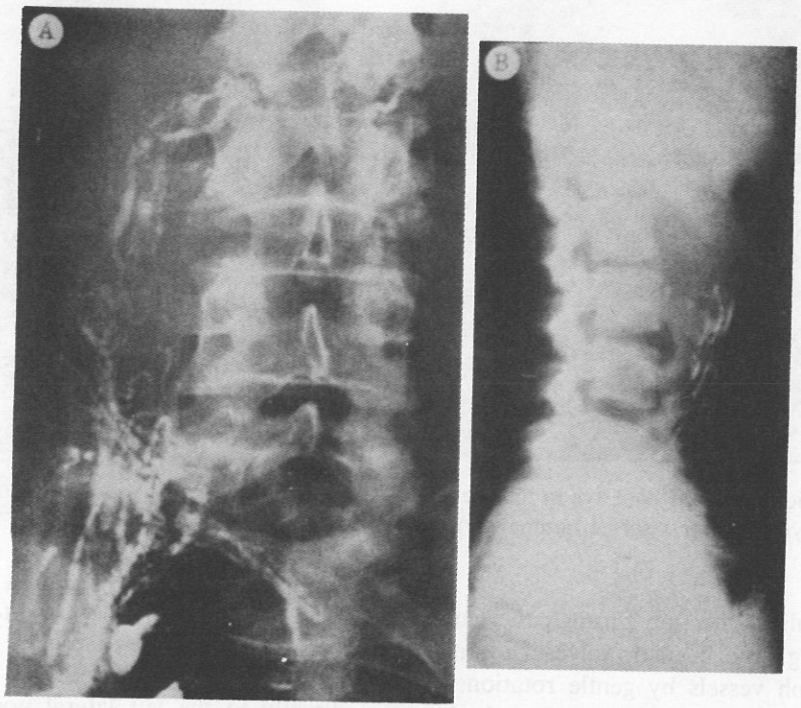

Figure 4. *A*, anarchic increase in size and number of lymph vessels with persistent visualization after 48 hours and early filling of dilated collaterals. Retroperitoneal metastasis in embryonal carcinoma of right testicle. *B*, embryonal carcinoma with choriocarcinoma shows massive displacement of lymph vessels without filling of primary relays.

are filled and stasis drives the ethiodol through the collateral routes. Both the preaortic and retroaortic groups are visualized after the lateral groups for the same reason. The thoracic duct is best visualized in pictures taken in the semierect position. It is not infrequently found on the right side.

Both Busch and Arvay have independently demonstrated a direct communication between the primary lateral nodes and the mediastinal nodes, independent of the thoracic duct. The pathological significance of this fact is of great importance.

Direct testicular lymphatic drainage to the illiac and inguinal nodes has been repeatedly demonstrated in those patients whose inguinal lymph vessels have been destroyed by previous surgery in that area. Both Bowles and Busch have reported carcinoma of the testicle with inguinal and iliac metastasis after previous inguinal surgery. In the normal case, we have never been able to demonstrate these collateral shunts, either for the testicle or the epididymis; yet, their potential development, when the main route is blocked, is unquestioned.

Interpretation of the films is often difficult. We have found certain points helpful in an effort to arrive at a precise diagnosis of cancer metastasis:

Lymph vessels: 1) an anarchic and haphazard increase in size and number defying anatomical description (fig. 4, A); 2) persistent visualization after 48 hours of injection; 3) massive displacement without filling of primary relays (fig. 4, B); and 4) early filling of collateral vessels without filling of the primary nodes.

Lymph nodes: 1) a crescentic or marginal filling defect in an enlarged gland (fig. 5, A); 2) a filling defect occupying 25 percent of an unenlarged gland; smaller lesions will be confused with chronic lymphadenitis, fat replacement and fibrosis (fig. 5, B); 3) constant central filling defects with or without glandular enlargement; these are typical of lmyphomas but also occur here (fig. 6, A); 4) the appear-

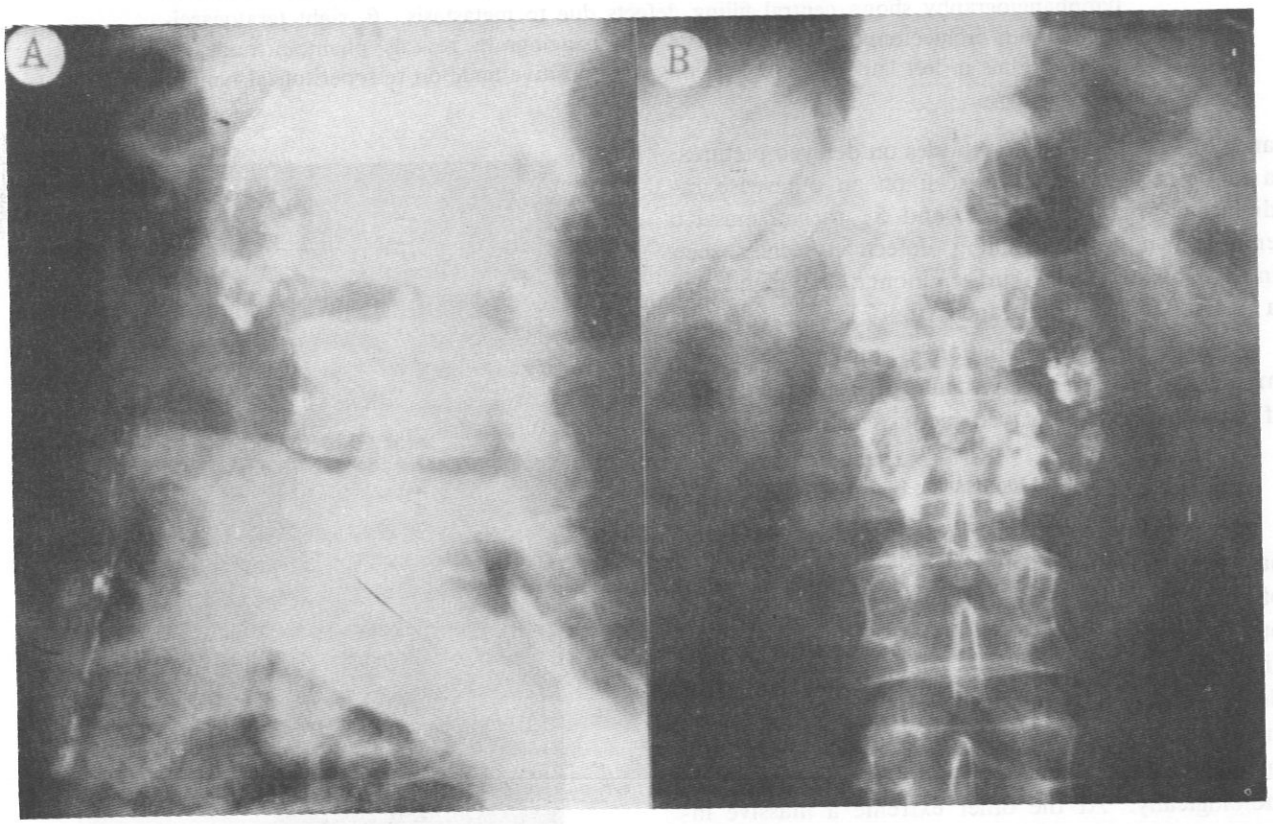

Figure 5. *A*, testicular lymphangiography in embryonal carcinoma with metastasis shows typical crescentic filling defect in enlarged gland. *B*, persistent filling defect on delayed films in small gland. Teratocarcinoma of left testicle with early lymph node metastasis.

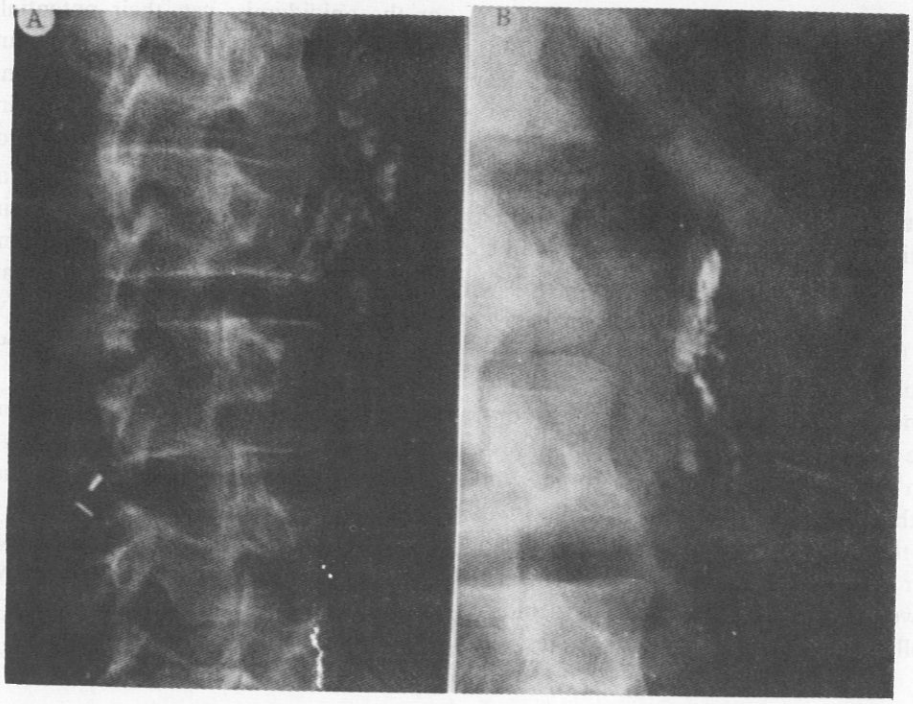

Figure 6. *A*, right embryonal cell carcinoma treated by orchiectomy. Left testicular lymphangiography shows central filling defects due to metastasis. *B*, right teratocarcinoma and orchiectomy. Left testicular lymphangiogram reveals phantom node on delayed films in left lateral area. This way only positive node on retroperitoneal lymphadenectomy.

ance of so-called phantom nodes on delayed pictures; a fine penciled border is seen on an otherwise radiolucent area (fig. 6, B); and 5) rarely, massive enlargement without filling defects typically seen in lymphoma is seen in seminoma; the gland has a coarse, foamy appearance (fig. 7).

Any one, or a combination, of these observations may be used for positive interpretation, but only if serial early and delayed pictures are taken.

Discussion

On the whole, early diagnosis of cancer metastasis has been disappointing. Advanced metastasis can, of course, be diagnosed easily by lymphangiography but the information is often only of academic significance. Studies have been helpful in confirming the presence but very rarely the extent of the metastasis. A microscopic involvement is of frequent occurrence and yet can rarely be spotted radiologically. At the other extreme a massive involvement totally blotting out a whole lymph node group can only be inferred by indirect signs. Therefore, negative signs and seemingly normal lymphangiograms remain without significance and only

Figure 7. Massive enlargement without filling defects seen in seminoma. Regression to normal size occurred after radiation.

positive readings are of value; when a positive reading is obtained in a previously unsuspected case the information is invaluable. There is a definite advantage in combining an inferior cavagram with lymphangiography 48 hours after the dye has been injected into the lymph vessels but this combined assault is outside the scope of our paper.

We believe that its most practical contributions have been made to the surgeon. Testicular lymphangiography clearly delineates the lower margin of retroperitoneal lymphadenectomy and makes imperative a bilateral node dissection extending to L1. Furthermore, an x-ray of the abdomen prior to closure will often reveal the thoroughness of the dissection. To the x-ray the therapist, it may be of some use as a rough measure of the effectiveness of his radiation in follow-up studies.

The treatment of lymphomas by the intralymphatic injection of radioisotope and chemotherapeutic agents has been developed by the Italian school. Their results in the treatment of cancer metastasis have not been as brilliant as those achieved in lymphomas. The difficulties here are mainly technical. It would seem to us that the inguinal route is ideally suited for this purpose not only because it is a more direct route to the retroperitoneal area and allows a more massive delivery of the agent used but because it lends itself to indwelling catheterization with the advantages of multiple and repeated doses spread over a number of days. Even after orchiectomy, a contralateral lymph vessel injection will give adequate access to both sides of the retroperitoneal area.

Summary

The technique, interpretation and practical applications of testicular lymphangiography in testicular tumors are described. Even though its contribution to early cancer diagnosis has been disappointing it has remained of great value to both the surgeon and the roentgen therapist. Its future in chemotherapy and radioisotope therapy of the retroperitoneal area seems promising and needs further investigation.

(The references may be seen in the original article.)

ISOIMMUNIZATION AFTER MULTIPLE TRANSFUSIONS*

Mary M. Lostumbo BS†, Paul V. Holland MD‡, and Paul J. Schmidt MD§,
Bethesda, Md. *New Eng J Med 275(3):141-144, July 21, 1966.*

The risk of isoimmunization after blood transfusion depends on the relative frequency of blood-group factors, their antigenicity and the number and timing of exposures (transfusions). There have been several approaches to determine the frequency of production of irregular antibodies, but the numbers and sequence of immunologic stimulations are usually not known or the results are based upon selected populations. Other investigations have attempted deliberate sensitization, an artificial situation that does not represent standard transfusion practice. However, using gene frequencies and the incidence of antibodies in several populations, Giblett has calculated the probability of stimulating one or more antibodies after one transfusion to be about 1 percent.

Many patients are receiving massive or repeated transfusions today with the increased use of heart-lung machines and, from Giblett's figures, the incidence of isoimmunization should be very high. However, Wallace and Henry concluded that the risk of red-cell isoimmunization after an average of 17 units of blood, transfused at open-heart surgery, was no greater than that incurred by the use of a single unit. In contrast to their findings, we have been impressed by the relatively frequent occurrence of irregular antibodies among our patients who underwent a similar procedure. This report is a study of the incidence and type of red-cell isoimmunization of 127 patients followed for as long as a year after multiple transfusions at open-heart surgery.

Patients and Methods

All patients who underwent open-heart surgery with cardiopulmonary bypass between October, 1963, and February, 1965, and on whom we were

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able to obtain and test at least 2 spaced follow-up blood samples were included in the study. The first sample had to be obtained in the second postoperative week, and the second, four to twelve months after operation. There were 127 patients in the study group, 76 males and 51 females, and they ranged in age from five to sixty-five years. Fifty-seven patients had had a prior opportunity for immunization to blood-group antigens—31 by transfusion, 16 during pregnancy, and 10 by both transfusion and pregnancy.

The heart-lung machine, a disk oxygenator with rotary pumps, was primed with 7 to 8 units of heparinized whole blood, and 4 to 5 units were added to a reservoir to replace operative losses. Citrated blood, less than forty-eight hours old, was given after operation as necessary. The 127 patients were exposed to 3,160 units of blood during the study, for an average of 24.9 units per patient.

All serum specimens from patients were tested before and after operation in the saline agglutinin test at 22 and 37°C and by the antiglobulin test against 2 separate reagent red-cell suspensions. These cells were known to react with antibodies to the H, $Rh_o(D)$, rh′(C), rh″(E), rh′(c), hr″(e), M, N, S, s, U, P_1, K, k, Kp^b, Js^b, Fy^a, Fy^b, Jk^a, Jk^b, Le^a, Le^b, Lu^a, Lu^b and Xg^a factors. In addition, after November, 1964, all serums were tested in the presence of papain with a single suspension made from the cells of 2 donors who had the $rh^w(C^w)$, rh″(E), hr′(c), $hr^v(V)$ and Js^a factors. When positive results were obtained in any of these screening tests, identification of antibody was attempted with a panel of reagent red blood cells. This panel was expanded to include additional cells when necessary for antibody identification and confirmation.

Direct antiglobulin (Coombs) tests were performed on all patients' anticoagulated blood samples before and after operation, 4 commercial antiglobulin serums being used in each test. The results were recorded by means of a modification of the scoring method of Race and Sanger and expressed as an average score.

All blood transfused was of compatible ABO group and $Rh_o(D)$ type and had been demonstrated to be free from irregular red-cell antibodies by testing in the saline agglutination test at 30 and 37°C and by the antiglobulin test against a single suspension made from the first 2 reagent red cells described above. It had been crossmatched with the patients' serums by the albumin-to-antiglobulin technic.

Results

Before operation 20 of the 127 patients were found to have an irregular red-cell antibody, with identified specificity in 10 cases (Table 1).

After operation 1 or more new antibodies were found in 43 (34 percent) of the patients; in 30 (24 percent) antibody specificity was demonstrated (Table 2). In 9 patients a positive direct antiglobulin test developed. One patient who had anti-Le^a before operation had a fourfold rise in the titer of his antibody although he received Le(a-) blood. No evidence of an immune response was found in 78 (62 percent) of the patients.

Table 1
Antibodies Present before Operation*

1	K (Kell)
1	M + K (Kell) + hr′ (c)
1	M
1	Lu^a (Lutheran)
1	Le^b (Lewis)
2	Le^a (Lewis)
3	H
1	Albumin-agglutinating phenomenon
9	Nonspecific

* Of 127 patients, 20 had demonstrable antibody.

A history of prior transfusion or pregnancy did not seem to influence the appearance of antibody. Nineteen (33 percent) of the 57 patients with such potential previous antigenic stimulation acquired new antibody as compared with 24 (34 percent) of 70 with no such history.

The 9 patients of the total of 127 in whom a positive direct antiglobulin test developed after operation could be divided into 2 groups: those who had a positive test immediately after operation, but not on subsequent testing; and those in whom the test became positive several months after surgery, persisting long after the potential survival of transfused cells.

There were 5 patients in the group with a positive direct antiglobulin test within the first or second week after multiple transfusions but a negative test six to twelve months later. One of these patients became jaundiced and had a fall in hematocrit and a rise in reticulocyte count to a high of 9 percent. An eluate prepared by the method of Landsteiner and Miller showed an anti-Fy^a (Duffy). When these laboratory values had returned to the normal range, and the direct antiglobulin test was no longer posi-

Table 2
Antibodies Appearing After Operations*

10	Lu^a (Lutheran)
5	K (Kell)
4	rh″ (E)
1	Fy^a (Duffy)
1	K (Kell) + Js^a (Sutter)
1	rh″ (E) + Fy^a (Duffy) + Lu^a (Lutheran)
1	rh″ (E) + hr^v (V) or Vs + M + H
1	Lu^a (Lutheran) + O or H
1	Le^b (Lewis)
1	I
1	IO or OI
2	O or H
10	Cold panagglutinin
4	Nonspecific

* New antibody developed in 43 of 127 patients.

tive, anti-Fy^a became detectable in the serum. Three of the patients in this group with transient positive antiglobulin tests had a fall in hematocrit (6, 8 and 12 percent) and hemoglobin (2.0, 2.5 and 3.5 gm per 100 ml) one to three weeks after operation. In 1 an anti-I, and in another a cold panagglutinin developed, but the third showed no free antibodies. The fifth patient had a mechanical autohemolytic anemia before surgery but this resolved during the postoperative period despite the presence of the positive direct Coombs test; he also had no free blood-group antibodies in his serum.

There were 122 patients whose direct antigloblin test was negative immediately after surgery. When tested next from two to seven months after operation, 4 of these had strongly positive direct antiglobulin tests, which have persisted through all subsequent testing (five to fifteen months later). One of these patients also had anti-K (Kell) in the serum, but the remainder were not found to have free antibody. All 4 of these patients have persistently elevated reticulocyte counts (2.2 to 3.2 percent) but no anemia.

Discussion

It is apparent from the results of this study that the risk of isoimmunization after multiple transfusions with open-heart surgery is considerable. Forty-three (34 percent) of 127 patients formed 1 or more new, irregular antibodies after an average of exposure of 24.9 units of blood; this is an incidence of 1.4 percent per unit. Of these, 30 (24 percent) were demonstrated to be specific antibodies, and 13 were in the Rh, Kell and Duffy systems known to be dangerous. The data indicate that the risk of isoimmunization is additive and is at least 1 percent per unit of transfused blood, thus confirming Giblett's hypothesis.

The high incidence of isoimmunization in this study contrasts sharply with previously published results. This is probably due to the more optimal timing of antibody-screening procedures. Pickles has noted that antibody usually did not develop until eight or nine weeks after the transfusion of Rh-positive blood to Rh-negative men, and concluded that the best time to look for antibody was twenty weeks after transfusion. One of our rr (cde/cde) patients (who was not included in the present study) bled so massively after open-heart surgery that he received 22 units of Rh_o (D) blood when no more Rh-negative blood was available. No irregular red-cell antibodies were found on 8 occasions in the ensuing two months but anti-Rh_o (D), anti-rh′ (C) and anti-rh″ (E) were present five months after transfusion. For these reasons we included in our study only the patients whom we were able to test not only in the immediate postoperative period but also again four months to a year later.

The most frequent cause of hemolytic transfusion reactions in present blood-bank practice are as follows, in order of occurrence: anti-K, anti-rh″ (E), anti-Fy^a and anti-hr′ (c). The most frequent antibodies found in our series are, again in order: anti-Lu^a, anti-K, anti-rh″ (E) and anti-Fy^a.

During the first two weeks after transfusion, anti-Lu^a developed in 10 of our patients. Two additional patients were found to have anti-Lu^a five weeks after transfusion. Anti-Lu^a was therefore the most frequent antibody in our patients, but, in all but 1, it was no longer detectable some months later. The donors to 5 of these 12 patients were tested for the Lu^a antigen, and all received Lu (a+) blood: 3 received 1 unit; 1 received 2 units; and 1 received 3 units. In a deliberate attempt to sensitize Lu (a−) patients with Lu (a+) blood, Mainwaring and Pickles found that in 2 out of 8 patients anti-Lu^a developed. Their agglutinins appeared fifteen and twenty-eight days after transfusion respectively, but were also detectable for only a short time. This transience explains why Race and Sanger state that anti-Lu^a is not a common antibody, and Greenwalt and Sasaki detected only three examples of anti-Lu^a when examining the serum of 18,600 normal blood donors. One in 10 patients as well as donors are Lu (a+), and we should therefore expect that since all our patients received

over 12 transfusions they were all exposed to the Lu^a antigen and that 114 (90 percent) were susceptible to immunization. The 10 percent incidence of antibody confirms the antigenicity found by Mainwaring and Pickles. Anti-Lu^a is a frequent result of transfusion, but since it is in low titer and transient, it is frequently missed. In addition, no cases of hemolytic transfusion reactions caused by anti-Lu^a have been reported.

When the serums from our patients were tested four to twelve months after transfusion a more usual pattern of sensitization occurred. Six patients had anti-K, and 6 had anti-rh″ (E), either alone or in combination with other antibodies. These 2 antibodies are usually found in highest frequency in series of sensitized persons. The incidence of the Kell antigen is 9 percent, so that approximately 116 (91 percent) of the patients in this study were susceptible to Kell sensitization; statistically, all were exposed to this antigen since the least-transfused patient received 13 units of blood (whereas the average exposure was 24.9 units). Six (5.2 percent) of these patients formed anti-K. Twenty-eight percent of people are rh″ (E) positive thus probably 91 (72 percent) of the patients were E negative. However, approximately 19 (15 percent) of the 127 patients would be rr (cde/cde) and were transfused only with Rh-negative blood. Therefore, about 72 patients were exposed to the E antigen and were potentially able to form anti-E; 6 (8.3 percent) did. It is interesting that anti-Js^a (Sutter) and anti-hr^v (V) or Vs were each found in 1 patient. Although this incidence is not high, it points out the importance of including these antigens, which are found essentially only in Negroes, in the antibody-detection procedures.

No patients in this study had anti-hr′ (c) despite the fact that hr′ (c) is considered almost as antigenic as Kell. Allen and Warshaw noted that the opportunity for exposure to hr′ (c) is greater in pregnancy and for exposure to Kell is greater in transfusion, and this may account for the greater frequency of anti-hr′ (c) in erythroblastosis fetalis and of anti-K in the patients receiving multiple transfusions. The patients in this study were transfused but did not have pregnancies during the period of observation.

In 5 patients a positive direct antiglobulin test developed shortly after multiple transfusions, but this test was negative six months to a year later. Four out of the 5 had a marked fall in hemoglobin and hematocrit, without evidence of bleeding at the time the direct antiglobulin tests were positive. These patients may be similar to those described by Pirofsky et al., who noted 7 such patients with a transient "autoimmune" syndrome manifested by a hemolytic anemia and a positive direct antiglobulin test. In both groups of patients the direct antiglobulin test was not positive after four months, the maximum life-span of red blood cells; therefore, the positive result may merely have been due to the coating of transfused cells with antibody and not true autoimmunity. These coated, transfused red cells undoubtedly had a shortened survival, resulting in a transient anemia postoperatively.

Hjelm et al., on the other hand, described a patient with a positive direct antiglobulin test from the sixth to the ninth month after cardiac surgery but "no signs of increased red cell destruction." Although this patient had a continued reticulocytosis (count of 2.4 percent) and lowered haptoglobin level (8 mg per 100 ml), he had no anemia. Four of the patients in our study had persistently elevated reticulocyte counts (2.2 to 3.2 percent) and positive direct antiglobulin tests five to fifteen months after transfusion, but no anemia. A reticulocytosis of this magnitude does not result in a positive direct antiglobulin test per se. Defective prosthetic valves can cause a mechanical hemolytic anemia, with reticulocyte counts as high as 8 percent, but they are not generally accompanied by a positive direct antiglobulin test. It is not known whether the normally functioning Starr-Edwards valves of our patients could be damaging red cells, causing both a reticulocytosis and a positive direct antiglobulin test, or whether a true autoimmune phenomenon is occurring. In any event this is a mild state, as evidenced by the ability of the patients to maintain a normal hemoglobin level.

The occurrence of irregular isoantibodies is a serious matter for these patients. They are increasingly becoming candidates for reoperation, since artificial prostheses require replacement, and many are females with childbearing potential. If antibody persists in high titer, it may be quite difficult to find compatible blood for future needs. For the patient with transient antibodies the problem is not so apparent but is potentially even more dangerous. Blood that is compatible by in vitro testing may provoke an anamnestic response, with a delayed hemolytic transfusion reaction. Stuckey et al. and Walker, Jennings and Monroe have described 3 such reactions due to anti-rh″ (E), an antibody formed by 8.3 percent of our susceptible patients. This may also have happened in our patient in whom

anti-Fy^a rapidly developed after multiple transfusions.

As a result of our experience, we now type our female patients under forty who are being prepared for open-heart surgry for rh″ (E) and Kell. Kell-negative and rh″ (E)-negative blood is given to those who lack these antigens. This is not a large problem since the majority of donors also lack these factors. Because anti-Lu^a has not been reported to cause hemolytic transfusion reactions we do not require compatibility in this system.

If a patient does become immunized, a notation about the presence of the irregular antibody should become a part of his medical record. In addition, he should carry such information along with his blood group and type, and any other pertinent medical information.

Summary

One or more new red-cell antibodies were found in 45 (34 percent) of 127 patients who received a massive transfusion (average of 24.9 units of blood) at the time of open-heart surgery. Of these antibodies, 30 were demonstrated to be blood-group specific. The most common antibody was anti-Lu^a (Lutheran), occurring in 12 patients. In 13 patients antibodies in the Rh, Kell and Duffy systems, known to be dangerous, developed. Nine of the 127 patients had a positive direct antiglobulin test before operation. The results indicated that the risk of isoimmunization is additive-approximately 1 percent per unit of transfused blood.

We are indebted to Dr. N. John Pappas for assistance in the planning of this study. The patients were all patients of Dr. A. G. Morrow.

(The references may be seen in the original article.)

DENTAL SECTION

STUDIES ON THE ACCEPTABILITY OF INCOMPLETELY FILLED ROOT CANALS

*Davis, M. S., Joseph, S. W., and Bucher, J. F.**

Forty root canals from the premolars of dogs were filled with gutta percha and Richert's formula root canal sealer, using the lateral condensation method. Twenty-one canals were filled to the working distance, twenty-two were filled at least three mm short of the working distance and five were grossly overfilled. All canals were prepared to the working distance or to within ½ mm of the radiographic apex.

The animals were divided into equal groups. One group was maintained for seventeen weeks, sacrified by perfusion, their mandibles segmented and prepared for histologic evalution. The other group was used for bacteriologic study. At the end of the seventeen week period material from the periapical areas of each treated canal, as well as some untreated controls, was extracted for culture by means of a Turkel bone marrow instrument using an extra-oral approach.

Six weeks before the termination of the experiment all of the animals received inoculations of a Group B, Beta hemolytic Streptococcus intravenously. Each animal received four injections containing approximately 1 billion viable organisms each at one hour intervals.

Preliminary findings indicate that incompletely filled root canals may be associated with excellent healing, including fill-in of the unfilled canal space with bone, cementum and periodontal ligament. Localization of injected microorganisms around the apices of endodontically treated teeth was not detected.

ABSORPTION AND EXCRETION OF MERCURY IN MAN—X. DENTAL AMALGAMS AS A SOURCE OF URINARY MERCURY

Hoover, A. W. and Goldwater, L. J. Arch Enviorn Health 12(3): 506–508, April, 1966.

The authors reviewed historic studies on the possibility that mercury-containing dental amalgams might contribute a significant source for systemic absorption of mercury. As recently as 1941, the literature has supported the belief that mercury appeared in the urine for about a week after insertion of amalgam restorations, but the amounts recovered were considered below a significant level. In previous studies on the "normal" mercury level of urine, one of the authors had observed that about 80 percent of samples contained no detectable mercury. On this basis, it was considered not unreasonable to assume that, if mercury-containing

* This study was conducted at the U.S. Naval Dental School and the authors acknowledge the collaboration of the Naval Medical Research Institute and the U. S. Naval Medical School, National Naval Medical Center, Bethesda, Md.

amalgam restorations were responsible for measurable levels of mercury in the urine, more than 20 percent of the previously studied samples should have shown some mercury. To study the possibility further, urinary samples from 114 cases were analysed. Cases were divided into groups containing nine edentulous subjects, and groups containing 0, 1–5, 6–10, 11–15, 16–20 and 21–28 amalgam restorations. A second group of 24 persons who were under active dental care at the time were sampled in intervals up to three days after insertion of an amalgam restoration. In the first group, only six persons showed detectable urinary mercury (and one of these six was known to be using a mercurial diuretic). In the second group, the proportion of subjects showing urinary mercury was higher than the first group, but the number with positive samples after an amalgam restoration was no greater than the number positive before placement of an amalgam restoration. The authors discussed the possibility of mercury absorption from other sources, and concluded that this study does not support the contention that dental amalgams contribute an important source of mercury absorption and excretion.

PERSONNEL AND PROFESSIONAL NOTES

THE DENTAL RECORD, SF 603. On several recent occasions errors in preparation of the original Dental Record, SF 603 and improper entries recording treatment have been noted by the Dental Division.

The Dental Record serves not only as a means of transmitting treatment information from one dental officer to another, but also serves as a means of identification of the dead, the basis for replies to congressional inquiries, and a record in the case of claims against the government. It is, therefore, of vital importance that the original record, and all examinations and entries made thereafter, reflect accurately and in detail the result of each examination and/or treatment. Each entry should be in accordance with the terminology set forth in Chapter 6, MANMED. Clarity and legibility in the recording of all entries are basic to the Dental Record serving the purposes for which it is intended. All dental officers, are, accordingly, enjoined to review their procedures as related to the above problems.

DENTAL SUPPORT IN VIETNAM. During a recent visit to Vietnam, CAPT W. E. Ludwick DC USN, Staff Dental Officer, Headquarters, U.S. Marine Corps had the following to say of the dental support to the Marines.

"The enlisted and officer personnel of the three dental companies in Vietnam are doing their jobs in an outstanding manner. Everywhere I go, the Marines have praised their efforts. Our people are working long hours and 6½ days a week. They are content and proud to be serving their country by providing treatment, participating in Civil Action Programs and assisting medical programs when needed."

ALTERATIONS OF DENTAL FACILITIES. Dental facilities that have undergone alterations or SHIPALTS are reminded to comply with the provisions of article 6–151 of the Manual of the Medical Department. When a dental facility completes an alteration such as additional DOR's, rearrangement of functional spaces, addition to existing facility, etc., an up-to-date DD 477–1 shall be submitted with current photographs and blueprints or schematic plans depicting the present status. Photographs should be labeled to indicate the date of the photograph, name of the activity, and number or name of the space photographed. Blueprints or schematic plans should contain the name of the activity, the date of the drawing, the scale used in the drawing, and the location of the dental facility in relation to the rest of the ship or station.

COMPLETENESS OF BUREAU OF PERSONNEL OFFICER RECORDS. In order to be doubly assured of the completeness of their BuPers records, all officers, especially those in the grade of Lieutenant Commander and Commander, are strongly advised to make sure their local commands forward a copy of all pertinent documents directly to the Chief of Naval Personnel, Attn: Pers E221. This should include noteworthy items of information regarding the officer which may be plus-factors for promotion, such as reports of completion of educational courses, publicly recognized civilian activities and presentations at professional meetings. Copies should continue to be forwarded to Chief, Bureau of Medicine and Surgery, Code 611.

U.S. NAVAL ACADEMY USES COMPUTER FOR DENTAL APPOINTMENTS. The U.S. Naval Academy has 4,000 students and the academic program for each student is selected from over 200 separate courses given on varying days and times. The academic day of the school corresponds to the normal working day of the dental department, but a table of priorities established by the command does not permit scheduling dental care during a period when a midshipman is in class. The problem was solved by using an IBM 7040 and 1401 computer.

The 7040 computer first provided the department with the separate schedule of each midshipman. It was then reprogrammed to furnish a listing, by day and hour, when each midshipman was not in class. This free-time information was fed into the 1401 computer which provided the department with a printed alphabetical list by class, giving the week, day and hour when each individual midshipman could be appointed for dental care without interfering with his academic routine.

The scheduling of dental appointments now becomes a rather routine matter. Once weekly, an appointment clerk pulls records from the files and separates them into the services of the department for which they have been coded. Using the IBM list for that week, he determines when each patient has free time and writes the patient's name on the dentist's daily work card. Only as much time is reserved for the patient as is indicated on his record. This frequently permits the scheduling of more than one patient an hour for a dentist, thereby conserving dental officer time. Twenty-four hours prior to the appointment, the clerk types up individual appointment slips which are delivered to the patient's immediate superior. Failed appointments result in disciplinary action. Following the patient's visit, if another appointment is required, the dentist makes a notation of the time required, and the service to which the patient should be sent. The record is then returned to the file.

The system described makes maximum use of patients' and dentists' time. It permits the scheduling of patients during the academic day without conflict with the academic schedule. It does require understanding by the academic scheduling office, and close liaison and cooperation between the dental department and the command. (CAPT W. R. Stanmeyer DC USN)

PREVENTIVE MEDICINE SECTION

PROBLEMS OF PLAGUE CONTROL IN SOUTHEAST ASIA

WHO Chronicle 20(2): 63–64, Feb., 1966.

Plague reported to WHO from Southeast Asia fell from 41,323 cases in 1950 to 109 in 1964. However, reservoirs of the disease among wild rodents continue to give rise to anxiety. The WHO Regional Committee for Southeast Asia expressed concern, at its 1964 session, about the known or suspected foci of sylvatic plague in India, Burma, Indonesia, and Mongolia and the persistent occurrence of human cases of plague in the central areas of southern India and in 3 areas in Burma.

Adding to the concern is the fact that rat fleas have developed resistance to certain types of insecticide, especially DDT. Further an alarming increase of uncontrolled rat infestation has been reported from these countries. In India a rough estimate based on sample surveys put the number of rats in the country at around 2,400 million—5 times as many as the human population.

During 1964 WHO engaged a consultant to assist the National Institute of Communicable Diseases in the study of the factors responsible for the persistence of plague in South India. So far it has been ascertained that foci of sylvatic plague are present in the area adjoining the inter-state borders of Andhra Pradesh, Madras, and Mysore, where *Pasteurella pestis* was isolated from *Tatera indica, Bandicota bengalensis,* and from the rat flea *Xenopsylla astia.*

Investigations carried out locally by the National Institute for Communicable Diseases in 1962 and 1963 showed that the rat fleas collected from commensal rodents were highly resistant to DDT and tolerant to BHC. It was considered that the DDT resistance was the result of the vectors' long-term exposure to insecticides during the nation-wide malaria eradication program. As to BHC, researches carried out in 24 villages indicated that although it too is a chlorinated hydrocarbon compound, the degree of susceptibility shown by fleas was such that BHC could keep the flea index under the limits of transmission for at least 3 months. For this reason,

and also because trials with other compounds, including dieldrin, had not been encouraging, it was decided to use BHC; it was hoped that the fleas would not build up a resistance, to any disturbing degree for 2 years. In the meantime other procedures for the control of plague were considered, in particular the reduction of the numbers of house rats by poisoning (this would also reduce the considerable loss of food caused by their depradations).

History of a Plague Cycle

In his report, the WHO consultant describes the plague cycle in the Kolar District of Mysore State. One of the dips in the number of plague cases started in 1955, when 360 human cases were recorded. In 1956 the number was 149, in 1957 it had fallen to 25, and in 1958 only 5 human cases of plague were reported in the whole District.

This decline coincided with the disappearance of plague from one of the most active foci in India, Uttar Pradesh in the north of the country, and led to expectations that the disease would probably be extinguished in the south also.

However, from 1959 onwards plague spread in the Kolar District, and in 1962 there were 585 human cases. The disease first appeared in 1959 in 2 villages of the District, and spread to 6 more in 1960. It was also reported in 7 villages over the border in Madras State.

During 1961 the affected area widened until it covered nearly 8,000 km^2 and included 88 villages, and in 1962 plague was reported from a total of 133 villages—97 in the Kolar District, 30 in Madras State, and 6 in the States of Andhra Pradesh.

In 1963, a decline began, only 36 villages reporting human plague. But, although the number of affected villages was rapidly decreasing in the central zone, it was increasing in the most eastern zone of the area (Chittoor District in Andhra Pradesh). This phenomenon became more evident during the first 7 months of 1964 when, although the decrease in the number of infected villages to 11 could be interpreted as a sign that the disease was dying out, the location of these villages had become epidemiologically alarming, since they were all on the periphery of the central zone.

Thus, while it was expected that the disease, following its 7-to-8-year cycle, would be at a minimum in the central zone in 1965, new outbreaks were anticipated in that year in and around localities that had reported infection late in 1963 and in 1964.

The role of field rodents in spreading the disease has been established. To attack plague at the source by attempting to exterminate the rodents would be a tremendous job. The reasonable solution is to increase vigilance in the suspected zones, regularly inspecting villages for rat carcasses or the first signs of infection in humans.

Some human problems of plague control

Two contrasting incidents will illustrate the importance of such close surveillance:

1. The presence of plague was confirmed in a village near the town of Palmaner. Investigations were made in the fields near the village and plague bacillus was isolated from a number of dead rodents, one of which was found about 2 km from Palmaner. The health authorities of the area were warned of the danger to the town. Action was at once taken and, although plague did eventually reach Palmaner and did cause an epizootic among house rats, the disease was completely controlled and no humans were affected.

2. Plague broke out in the village of Dandapalli, a little more than 1 km north of Palmaner. The inhabitants failed to report the presence of dead rats to the Health Inspector. This omission cost them 5 human cases, with 2 deaths. It was only then that they sought help. The disease was eventually controlled, and there were no further cases.

Indications of the presence of plague may be deliberately withheld from the health authorities, with consequent loss of life "in spite of the fact that plague has become among the most easily curable diseases in the world". Take, for example, the outbreak in the village of Penchupadu, where, after detailed inquiries, it was learned that rat falls had been observed in several houses and that human cases had occurred 6 or 7 weeks previously. A routine inspection of the village had been carried out 2 weeks before, at a time when the disease was already in full evolution and the first 2 deaths had occurred, but nobdy in the village had mentioned these facts. Eventually 2 patients from the village consulted a private physician, who treated them for ordinary adenopathy but later became alarmed when other people from the village came to him with the same symptoms. When he heard that a large number of rats had been found in the village, he reported the matter to the authorities.

Antiplague measures in Penchupadu, though late, stopped the disease promptly and no fresh human cases were reported. But, as a result of the conspiracy of silence, 4 people in the village had already lost their lives.

The WHO consultant draws attention to a factor that may contribute to the spread of plague in one area—the practice among certain nomads of catching rodents to eat. There is every reason to believe that field plague can be transmitted through the collection and handling of rodents, and especially through the introduction into human dwellings of the considerable number of fleas harbored by the rodents.

MILITARY AND CIVILIAN CASES OF MALARIA

UNITED STATES 1956–1965*

Year	Military	Civilian	Total
1956	46	79	125
1957	56	47	103
1958	33	39	72
1959	12	42	54
1960	21	42	63
1961	45	40	85
1962	75	44	119
1963	58	90	148
1964	52	119	171
1965	51	105	156

* Onset of illness in the United States and Puerto Rico.

The 1965 total is the second highest in the past 10 years of the Malaria Surveillance Program. Cases classified as: 154 imported, 1 introduced, and 1 cryptic. *P. vivax* was the etiologic agent in the majority of cases (60.4%). *P. falciparum* accounted for 27.1% of the cases. *P. malariae* accounted for 9.0% of the 1965 cases. (CDC Malaria Surveillance—1965 Annual Summary)

COCKROACH CONTROL AND ECONOMICS

The following two articles present a new insight to the eternal problem of cockroach control aboard naval vessels. They are reproduced with grateful acknowledgement to the units responsible.

Non-Standard Pesticides; Unauthorized Procurement of (from a letter to BuMed by PMU #6)

1. A representative of this Unit contacted a (U.S. naval) ship in the course of providing routine pest control services to fleet units.

2. This vessel recently had procured a non-standard insecticide dispenser and 20 gallons of proprietary insecticide consisting of 0.4% pyrethrins and synergists in a solvent at a cost of $195.50. Procurement of an additional 20 gallons at $6.60 per gallon was planned. Reportedly this procurement was arranged at higher echelon after demonstration of cockroach control with this method by a commercial representative. The procedure consists of application of 1 gallon each week in galleys, messing spaces, and storage areas. The annual cost for insecticide therefore would be $343 (52 x $6.60).

3. The standard method now authorized for shipboard control utilizes the stock item, Insecticide, Diazinon, 0.5%, FSN 6840–844–7355, cost 92¢ per gallon. This material is applied as a residual in galleys, messing spaces and storage areas and is effective for 2 to 4 months. This period may be extended considerably by supplementary use of a Kepone bait preparation. Even if application of 3 gallons every 2 months were necessary, the cost would be less than $17. Adding another $6 for Kepone bait would bring the maximum annual cost for the materials to less than $23. Observations of over 50 vessels based at or passing through Pearl Harbor in the past year show that this method provides effective control.

4. The difference in cost between the standard and proprietary method is $320 per annum per vessel. The monetary loss to the Navy of extension of this method to any sizable number of naval vessels is obvious.

5. BuMed Instruction 6250.8 of 30 December 1959, Subj: Shipboard Pest Control Training Program, provides for a standard training program for personnel assigned responsibilities in or relating to pest control aboard ships and lists the locations at which this training is available. The training includes detailed instruction and demonstration of the control methods described in paragraph 3 above.

6. SecNav Instruction 5430.54 of 27 December 1961, Subj: Pest Control Operations; responsibilities for and functions of, in paragraph 6d, requires that all fleet requisitions for non-standard pesticides be approved by the appropriate area Preventive Medicine Unit or Disease Vector Control Center.

Cockroach Control

(from an article in "Health Notes" Jan 1966 by PMU 2)

NOT ONE SINGLE COCKROACH WAS EVER KILLED BY MAINTAINING A CLEAN SHIP! Cockroach control depends largely on the elimination of their 2 greatest needs: harborage (hiding and breeding places) and drinking water (moisture). Cockroaches require very little food in order to survive. They will eat cast skins (shed as they grow) and egg cases (after young have

hatched), as well as dead roaches and other organic debris. Since they literally manufacture their own food, the most immaculately clean ship could still have cockroaches!

Since it is almost impossible to eliminate or reduce moisture and condensation on board ship, the only avenue of action left is elimination of harborage and breeding sites. In most cases, infestations are centered in 2 or 3 high population areas. The roaches will then migrate from these areas, making it appear that there is a general infestation throughout a given space. Once these areas are located, positive steps may be taken to eliminate them. The most likely places are the galley, vegetable preparation room, bake shop, garbage disposal space, butcher shop, areas around coffee urns and serving lines, and other food service spaces. Excellent harborage is provided by the following listed structural deficiencies: (a) old, torn, worn out, or loose fitting insulation, (b) stainless steel plates which fit flush against the bulkheads, (c) inaccessible areas behind ovens and around hoods, (d) iron supports under counters in good preparation areas, serving lines, coffee urns, (e) double walled bulkheads, stainless steel serving lines or other double walled sites which create a void, and (f) other problem areas of lesser consequence. Most of these areas can be made undesirable hiding places by structural modification.

Elimination of harborage will expose the cockroach population to the action of the residual insecticide, Diazinon. Locating these hiding and breeding sites is facilitated by use of a Pyrethrum aerosol bomb (FSN 6840–823–7849). This material, when sprayed into a suspected hiding place, irritates the cockroaches and drives them out, giving an accurate picture of the numbers residing there and thereby designating high population sites.

Another important misconception is that simply "spraying" will effectively kill roaches. Treating decks, base boards, and areas under counters is not effective in contacting the majority of the population. The material must be applied where the insect is living. Roaches will not leave a secure hiding place in an insulated over-head just to walk through a foul smelling, toxic chemical sprayed on the deck. Almost all the complaints received by this Unit regarding noneffectiveness of the residual insecticide have proven, upon investigation, to be either improper spraying techniques, or a plurality of hiding places, making control nearly impossible.

The additional guidelines for application of 0.5% Diazinon as a residual spray are: (1) set up a regularly scheduled program with applications every three to four weeks; (2) do not wash down the area sprayed for at least 1 week after application.

The abandonment of sanitary practices is not advocated in favor of elimination of harborage. Cleanliness is very important in limiting the size of the population, since the amount of food available determines the degree to which the colony may expand. It should be emphasized that unless all aspects of the cockroach control program are properly practiced, the effort expended will not yield the desired results. A coordination of (1) elimination of harborage, (2) scheduled spraying (using proper techniques) and (3) a high level of sanitation is necessary to control cockroaches on board ship.

Specific recommendations for one ship may not hold for another, therefore, advice concerning cockroach control aboard your ship should be obtained from the closest military entomologist. Preventive Medicine Units and Disease Vector Control Centers stand ready to render this service.

COMMUNITY WATER FLUORIDATION

Sebelius, Carl L. Sec Am Den Assoc, Bull of the Pan American San Office 59(3): 197–200, Sept., 1965.

Since 1950 the American Dental Association has endorsed fluoridation of the community water supply as a safe, economical and effective measure to reduce the incidence of tooth decay up to 60 percent. A vast body of research established water fluoridation at the level of 1 ppm as the most effective preventive of tooth decay and safe for people of all ages. All the qualified health organizations in the United States support fluoridation, including the U.S. Public Health Service and the American Medical Association. The U.S. Junior Chamber of Commerce has reviewed the scientific testimony and supports and promotes fluoridation.

As of 1964 more than 2,600 communities across the United States had adopted fluoridation for more than 46 million people. The engineering procedure has become routine for more than 1,400 water systems. An additional 7 million people live in communities with a natural fluoride content in the water of 0.7 ppm or above. One in five Canadians also has fluoridated water.

Alternatives to water fluoridation include tablets, home fluoridators, fluoride-vitamin supplements and fluoride dentifrices—none as effective, as inexpensive and as easy of access as community water fluoridation.

A 1962 American Dental Association statement urges dentists to assume their professional responsibility to obtain fluoridation for more people.

THE OUTLOOK FOR MEN WITH MYOCARDIAL INFARCTION

Stat Bull Met Life Ins Co 46: 1–3, October 1965.

A number of follow-up studies have become available in recent years on the prognosis of men with coronary disease, more particularly those with a first myocardial infarction. It is clear that men who have suffered a myocardial infarction experience high mortality rates, at least in the first few years after attack.

Table I compares the estimated mortality and survivorship of men in their late 40's and early 50's who survived a first myocardial infarction for at least 90 days and were able to return to work, with the corresponding experience for groups of standard life insurance risks, who may be regarded as representing persons in good health. The estimates are expressed in ranges rather than single values, in order to take account of initial differences in the

TABLE I

Mortality and Survivorship After First Myocardial Infarction

Among Men in Their Late Forties and Early Fifties and Corresponding Experience of Standard Life Insurance Risks

GROUP	MORTALITY; SURVIVORSHIP		
	MORTALITY RATIOS		
	First Year After Onset	Fifth Year After Onset	Tenth Year After Onset
Standard Life insurance risks	100%	100%	100%
Men with first myocardial infarction			
Applicants for Life insurance	1500%–1000%	800%–500%	*
Disabled policyholders	2000 –1500	1200 –750	600%–300%
Insurance company employees	1500 –1000	800 –500	500 –250
Employees in industry	1750 –1250	800 –500	*
	SURVIVORSHIP RATES		
	One Year After Onset	Five Years After Onset	Ten Years After Onset
Standard Life insurance risks	99%	98%	94%
Men with first myocardal infarction			
Applicants for Life insurance	98%	80%–88%	68%–78%
Disabled policyholders	91 –96	68 –78	40 –56
Insurance company employees	91 –94	72 –78	50 –60
Employees in industry	90 –92	71 –77	*
Hospital, clinic, and private patients	81 –95	50 –77	*
	APPROXIMATE EXPECTATION OF LIFE		
	Age 45	Age 55	
Standard Life insurance risks	28–32 years	19–24 years	
Men with first myocardal infarction			
Applicants for Life insurance	17–19 years	16–18 years	
Disabled policyholders	11–15	9–14	
Insurance company employees	16–19	11–16	
Employees in industry	*	10–13	
Hospital, clinic, and private patients	12–14	7–11	

* Not available.

health of individuals, the severity of attacks, and the presence of other serious impairments.

Separate consideration is given to several groups of men: applications for life insurance with proven or suspected myocardial infarction, who are usually in apparent good health and carry on normal activities at time of application for insurance; life insurance policy-holders who were sufficiently disabled by coronary disease to qualify for disability benefits; various groups of employees followed after episodes of coronary disease; and hospital, clinic, and private patients surviving myocardial infarction.

The mortality of men with a first myocardial infarction is from 10 to 20 times that for standard life insurance risks in the first year after attack. The excess mortality is particularly high among those who had been disabled by a coronary attack.

In each group studied, the excess mortality decreased sharply with time elapsed after the attack. Thus, in the fifth year following the attack, the death rate among the disabled policyholders ranged from 7½ to 12 times that for standard insurance risks; in the other groups it was from 5 to 8 times the standard.

Computations were also made of the proportion of men surviving a specified number of years after the attack; the results are shown in the middle tier of the table. In almost all the groups under review, 90 percent or more of those who had survived the first 90 days were alive at the end of the first year. The proportions surviving decreased much more sharply with time among men who had a first myocardial infarction than for standard risks.

During the period covered by the studies, the expectation of life for standard life insurance risks at age 45 ranged from 28 to 32 years. The remaining years of life for men at that age with a first myocardial infarction varies from 11 to 19 years. At age 55, the corresponding life expectancies for the two groups were estimated to range from 19 to 24 years and from 7 to 19 years, respectively.

The most favorable prognoses apply to individuals who have normal weight and blood pressure, are free of other cardiovascular impairments, have not had chest pain of cardiac origin after recovery, and do not show any symptoms of coronary insufficiency. The prognoses would be somewhat less favorable for individuals who are overweight, have a family history of early cardiovascular disease, or have other significant impairments.

Persons with moderate elevations in blood pressure, those reporting persistent chest pain since the attack, and those showing marked coronary insufficiency would have a distinctly poorer than average prognosis. This would also apply to individuals with diabetes and to those with a second infarction.

Persons with latent coronary insufficiency who show no evidence of myocardial infarction have a much better outlook than those with an infarction. Individuals with mild or moderate coronary insufficiency, if they are otherwise in good health, clearly have a more favorable prognosis than those with a diagnosed myocardial infarction.

KNOW YOUR WORLD

Did You Know?

That 25,000 suicides occur in the United States each year?

Suicidal attempts are even more numerous. (1)

That a 5-year old Navajo Indian boy, who died on 23 May 1966 in Monument Valley Hospital was reported on 13 June as a retrospectively diagnosed plague case?

He resided in the Indian Reservation near Oljath, San Juan County. (2)

That experts of the World Health Organization and India took part in conducting a course in Cholera, held at Hyderabad, India, from 18-30 July 1966?

Thirty participants from Afghanistan, Burma, Ceylon, India, Indonesia, Nepal and Thailand attended to study laboratory diagnosis, clinical diagnosis and treatment, epidemiology and prevention and control of cholera. (3)

That the U.S. Department of Agriculture awarded a $71,400 contract to scientists of the Plant Pathology Department of the North Carolina State University, Raleigh, to study interactions between parasitic nematodes and other disease-causing organisms of tobacco?

It is known that complex relationships exist between tobacco plants, nematodes and pathogenic fungi, bacteria and viruses. These scientists will identify the substances favoring pathogenic development and determine relationships to smoking and health. (4)

That there were about 18.2 million persons age 65 and over by the end of 1965?

This is a gain of 1.6 million since the Census was taken in April 1960 and 5.9 million since April 1950. There are 2,300,000 more older women than men; respective totals being 10,225,000 and 7,931,000. (5)

That in the United States, by the end of 1965, the population had increased by 2,336,000 bringing the total, including the Armed Forces overseas, to 195,832,000. (6)

That Indian quinine sulfate and alkaloids have been in great demand recently in some European countries, especially Holland and West Germany?

Due to lack of supplies from Java and the Congo, India has become a prime supplier. West Bengal and Madras provinces of India plan to expand cinchona plantations and step-up quinine production to meet the demands of the foreign market. (7)

That scrub typhus is common throughout Malaya and frequently affects troops on jungle maneuvers and that recently about 50 cases occurred in Gurkha soldiers fighting in the jungle of Southern Johore?

Not long after this, about 40 soldiers from one battalion of British soldiers were affected in North Western districts of Malaya. Previous to the discovery of chloramphenicol the overall mortality rate was 45%. Patients very rarely die nowadays. (8)

That the 8th integrated rural health center built at San Felix, Panama was inaugurated on 20 February 1966, under the Alliance for Progress Program?

A total of 11 such integrated rural health facilities are planned. The program will cost 1 million dollars in grant aid from the Aid for International Development Mission plus a contribution from the Panamanian Government equivalent to $100,000. (9)

That the United States has contributed $13.4 million dollars worth of commodities to the World Food Program?

From the inception of the program, 1 January 1963, to 31 December 1964, the United States had donated $40 million in commodities and $10 million in cash and shipping services. (10)

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EDITORIAL DESK

FIFTEENTH ANNUAL ARMED FORCES OB-GYN SEMINAR

The Army will act as host for the above seminar, which will be held at the Fitzsimons General Hospital, Denver, Colorado, 24-27 October 1966.

All fully-qualified obstetricians and residents in this specialty on active duty are eligible to attend. Only a limited number of officers can be authorized to attend the seminar on travel and per diem orders chargeable against Bureau of Medicine and Surgery funds. Eligible and interested officers who cannot be provided with travel orders to attend at Navy expense may be issued Authorization Orders by their Commanding Officers following confirmation by this Bureau that space is available. It is anticipated that a Government airlift will be available departing from Naval Air Facility Andrews on 23 October and returning from Denver, Colorado on 28 October 1966.

Requests should be forwarded via chain of command, in accordance with BUMED INSTRUCTION 1520.8 Series.—Training Branch, BuMed.

AMERICAN COLLEGE OF SURGEONS ANNUAL MEETING

This year's Annual Meeting will be held in San Francisco, California, 10 October through 14 October 1966. A special airlift is being tentatively scheduled to accommodate medical officers of the Armed Forces who desire to attend this meeting. The aircraft will depart from Andrews Air Force Base, Washington, D. C. on Sunday, 9 October 1966, and return to Washington on Saturday, 15 October 1966. Stopovers will be made at the U. S. Naval Air Station, Glenview, Ill., for passengers.

Interested medical officers should forward request for reservations at least 3 weeks in advance of the meeting to: Director, Professional Division, BuMed; or telephone Oxford 61280 or 61834. Further in-

formation concerning the airlift will be announced later. Professional Division, BuMed.

AMERICAN BOARD OF OB-GYN

Applications to take Part I (written) examination on July 3, 1967 and letters requesting to be scheduled for re-examination will be accepted in the office of the Secretary during October and November, 1966. Those postmarked after November 30th will not be processed for examination in 1967.

Applications to take Part II (oral) examination November 6-10, 1967 will be accepted in the office of the Secretary during January and February, 1967. Those applications postmarked after February 28th will not be acted upon in 1967. All Part II applications must be accompanied by duplicate lists of patients dismissed from candidates' service during the twelve months immediately preceding the month of application. A sample format to be followed in the listing of patients is enclosed in each application form.

Prospective candidates are urged to review the current Bulletin of the Board for complete information on the requirements for application. Application forms and Bulletins may be obtained by writing to the office of the Secretary, Clyde L. Randall MD, 100 Meadow Road, Buffalo, New York 14216.

Diplomates and Candidates are requested to keep the Board office advised of their current address.

MILITARY NURSING SYMPOSIUM CONDUCTED FOR RESERVE NURSE CORPS OFFICERS

A military nursing symposium was conducted at the U. S. Naval Medical School, Bethesda, Maryland during the period of 1-12 August 1966. Forty-six Naval Reserve Nurse Corps officers representing states from the east coast to the west coast attended the course. The rank of members attending ranged from lieutenant through commander.

The theme of the course was "Nursing Implications in Current Military Operations."

Sister Joyce Harvey, Superintending Sister of Britain's Royal Naval Nursing Service attended the course as a guest. She addressed the group during the morning session on Friday, 5 August 1966 concerning nursing in her service.—Nursing Division, BuMed.

NAVY NURSE FIRST WOMAN TO MAKE SURFACE ASCENT IN ESCAPE TANK

LT Vera J. Noble NC USNR, recently made a practice escape in connection with a two week course in hyperbaric submarine medicine given at New London, Connecticut. She made simulated escapes from the 50 foot depth using the "buoyant ascent" method in which no breathing devises are used and the "free breathing buoyant ascent" using the Steinke Hood. LT Noble is the first woman known to make an ascent using the buoyant method in which the escapee expels air while being carried to the surface by an inflated life jacket. She was also the first student in a new two week course in hyperbaric medical applications designed to give nurses instruction and practice in current techniques in Navy recompression chambers. LT Noble was assigned to the Submarine Base Medical Center for two weeks of active duty training.—Nursing Division, BuMed.

USN OPENS NEW HOSPITAL

The Navy's new hospital for Naples was dedicated by ADM C. D. Griffin, Commander Allied Forces Southern Europe (CINCSOUTH).

An estimated 500 guests including the Prefect of Naples attended the opening day ceremony.

In his dedicatory remarks ADM Griffin told the guests that the military establishment often unveils new instruments of war but that it was a greater pleasure for him to dedicate a new hospital.

Structural weaknesses and insufficient space in the old hospital, he said, hampered the staff creating a need for better medical facilities. The new hospital, ADM Griffin said, is the answer to that need.

The hospital is a reinforced concrete frame construction. Floors are, with few exceptions, polished Italian marble.

Modern hospital systems included in the facility are a centralized gas system, three totally air conditioned operating rooms and provisions for the installation of the latest diagnostic and specialty treatment equipment.

The seven story, 79,000 sq. ft. new building will be leased by the United States for five years at approximately $115,000 per year, with an option for an additional 15 years.

The location of the hospital, a crater in Agnano, near Naples, was chosen as a consolidation site for Navy activities in the city which are now spread over wide areas.

OFFICIALLY OPENED—ADM C. D. Griffin, Commander Allied Forces Southern Europe, holds and CAPT Richard Lawrence, Station Hospital Senior Medical Officer, cuts the traditional ribbon officially opening the Navy's new hospital in Agnano, near Naples. The ribbon-cutting followed a dedication ceremony.—Official U.S. Navy Photograph.

The hospital serves U. S. Army, Navy, Air Force, Marine Corps, Coast Guard and U. S. civilian personnel and their dependents in Naples. MGEN R. T. Jenkins of Headquarters Air Force Europe was present for the ceremony.

The ceremony was opened by the CINCSOUTH Band, which played the Italian and American national anthems. Naval Support Activity (NSA), Naples, Senior Chaplain CDR G. L. Martin, gave the invocation. Speakers were introduced by CDR D. R. Trueblood, CEC, NSA Resident Officer in Charge of Construction.

Engineer Carlo Brancaccio of the Italian firm of Loy, Dona and Brancaccio, contractors for the project, presented CAPT T. J. Doyle, CEC, Commanding Officer European Division Naval Facilities Engineering Command, with the keys to the new building.

Brief welcoming remarks were made by CAPT H. S. Bottomley Jr., NSA commanding officer. CAPT Richard Lawrence, Senior Medical Officer at Naples and representative of the Navy's Bureau of Medicine and Surgery, cut the ribbon opening the hospital.

Later this year, the NSA Dental Clinic will move into the top floor of the hospital. Offices for the NSA Chaplains and American Red Cross representatives will also be located there.—Public Affairs Office, U. S. Naval Support Activity, Box 40, New York 09521.

NAVY MEDICAL SERVICE CORPS CELEBRATES

Navy Medical Service Corps officers in the Washington area will long remember their 19th Anniversary celebration on August 5, 1966. The day was particularly momentous for CAPT Robert S. Herrmann of 4914 Aspen Hill Road, Rockville, Md.

In the early afternoon the Navy Surgeon General, VADM Robert B. Brown, announced the reappointment of CAPT Herrmann, Chief of the Navy Medical Service Corps for a two year term. The oath of office ceremony was witnessed by friends and co-workers. CAPT Herrmann has served as Chief of the Navy Medical Service Corps since October 1, 1962.

CAPT Herrmann talks to Navy Medical Service Corps officers in DaNang while VADM and Mrs. Brown (center) and Mrs. Herrmann listen to the amplified conversation. Mrs. L. W. Gay, (left) wife of the caller, awaits her turn.—Official U.S. Navy Photograph.

The evening reception at the Bethesda Naval Medical Center Officers' Club, which is always festive, now had added meaning. Over 500 fellow officers and their ladies, from near and far, donned formal attire to congratulate their new chief and to observe the 19th Anniversary. The Terrace Room was decorated in a nautical theme including a replica from "Mr. Roberts". Well-wishers trekked up the gangway to a quarterdeck where they were introduced to VADM Brown, CAPT Herrmann and their ladies by CDR T. G. McMahon, party committee chairman. Friends from the other Services including the Deputy Surgeon General of the Army, MGEN McGibony and BGEN Anderson of Marine Corps Headquarters were among the guests.

The most touching event of the evening came from the other side of the world. Dr. Herrmann received a very long-distance call of congratulations from CDR L. W. Gay and other Navy Medical Service Corps officers on duty with the Marine

Corps at DaNang, Vietnam. The callers were in turn treated to early news of Herrmann's reappointment.

The ensuing cake-cutting ceremony was a solemn affair. The initial piece was presented to the First Lady of the Navy Medical Department, Mrs. Robert B. Brown. Formalities of the evening were climaxed when an obviously pleased and proud CAPT Herrmann wished "for one and all, Happy Anniversary."

Robert Stott Herrmann is the son of Mr. and Mrs. Frank C. Herrmann, 1058 South High Street, Denver. He attended Colorado College and Denver University where he majored in psychology and earned BA, MA and PhD degrees. CAPT Herrmann is married to the former Miss Betty Ann Christy, also of Denver. They reside at the Rockville, Md. address with their daughter, Lynn. Another daughter Ann and a son, Robert, attend college in Colorado.—Public Affairs Office, NNMC, Bethesda, Md.

NINTH NAVY SURGEON GENERAL'S AWARD

The Deputy Chief, Bureau of Medicine and Surgery, RADM R.O. Canada MC USN, presented the United States Navy Surgeon General's Annual Award for Scholastic Achievement to LT John R. Kozik MSC USN, at graduation ceremonies for the Twenty-Seventh Class at the U.S. Naval School of Hospital Administration, on 10 June 1966. The award, established in 1957, is based on academic achievement, overall application, and qualification.

RADM R.O. Canada (Right) present the Surgeon General Award to LT John R. Kozik MSC USN.—Official U.S. Navy Photograph.

LT Kozik, the ninth recipient of the Surgeon General's Award, was born in Chicago, Illinois, on 22 July 1932. He enlisted in the Navy in 1952 and was commissioned an Ensign in the Medical Service Corps in 1961. During his 15 years of Naval Service, he has served in the following U.S. Naval Hospitals and U.S. Naval Ships: Jacksonville, Florida; Bethesda, Maryland; Memphis, Tennessee; Portsmouth, Virginia; USS Baltimore (CA–68); USNS Private E. H. Johnson (TAP–184); USS Arnold J. Isbell (DD–869); and prior to reporting to the U.S. Naval School of Hospital Administration, he was serving in the District Medical Office, Sixth Naval District, Charleston, South Carolina.

LT Kozik is reporting for duty to the Bureau of Medicine and Surgery, Navy Department, Washington, D.C.—Public Affairs Office, NNMC, Bethesda, Md.

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